

AI AUTOMOTIVE INDUSTRIES

AUTOMOTIVE and AVIATION MANUFACTURING
ENGINEERING • PRODUCTION • MANAGEMENT

JULY 15, 1958

In This Issue

Two-Panel Hoods Produced on Mechanized Lines
Automotive and Aircraft Applications for Tin
Mack Truck Modernizes Facilities for Making Cabs
Efficient Frame Production at A. O. Smith Plant
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Hardening Parts in Radiant Tube Furnaces

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A C H I L T O N P U B L I C A T I O N

it's mainly a matter of **TIMING!**

**Knowing WHEN to replace a machine
saved one manufacturer \$16,794 a year**

TAKE ANY machine in your plant. You know that some day it will have to be replaced. But *when*? That is the big question. And wrong answers probably cost American Industry millions of dollars every year.

For any machine, there is one optimum replacement time—the time when it can be replaced with a new one at *lowest overall cost*. And it can't be determined by haphazard methods. Guesswork, intuition or rule-of-thumb computations will be wrong most of the time. And even some obsolescence formulas are not above suspicion. But you can put a dollar sign on every variable involved, and

come up with a precise figure that will mean a major saving in production cost and capital investment.

Heald sales engineers are well experienced in making obsolescence studies to determine when a machine should be replaced. Sometimes it is found that replacement is overdue. And often it can be shown that next year or the year after would be better for the customer. If you would like help in planning your replacement program, or want to confirm your estimates for a particular machine, just call in your Heald engineer. Similar studies have pointed the way to many important savings.

For Example: A manufacturer of aircraft instruments had been using a 5-year-old precision lathe to perform boring, turning and facing operations on instrument cases. But when this was replaced with a new Heald Model O Unit-Type Bore-Matic like that shown at the right, operating costs for the same production were immediately reduced by over 78%. In addition, the elimination of a separate burring operation and reduced assembly time made further important savings, as indicated by the cost analysis below.

	Old Machine	New Machine
Parts per hour	4.3	20
Parts per year (Req'd. Prod.)	10,000	10,000
Direct and Indirect Labor, per year	\$20,349	\$ 6,055
Scrap Losses, per year	\$ 500	\$ 300
Annual Maintenance Cost	\$ 600	\$ 300
Annual Operating Cost	\$21,449	\$ 6,655
Basic Annual Saving, New Machine		\$14,794
Additional Saving from elimination of separate operation		\$ 500
Additional Saving from reduced assembly time		\$ 1,500
Total Saving Per Year		\$16,794
Return on Investment for New Machine		84%



YOU pay for obsolescence. Replacement pays for itself!

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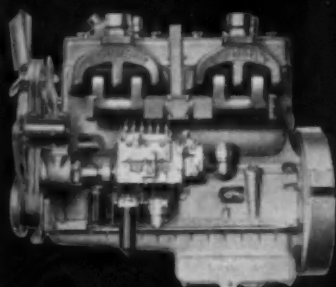
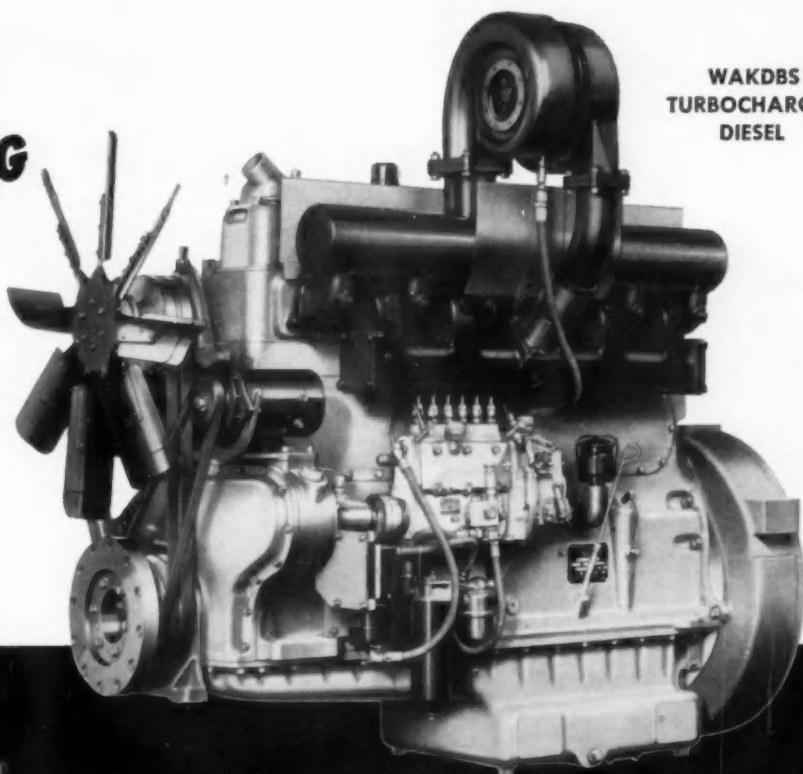
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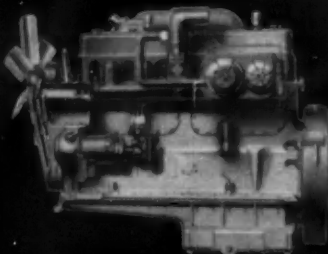
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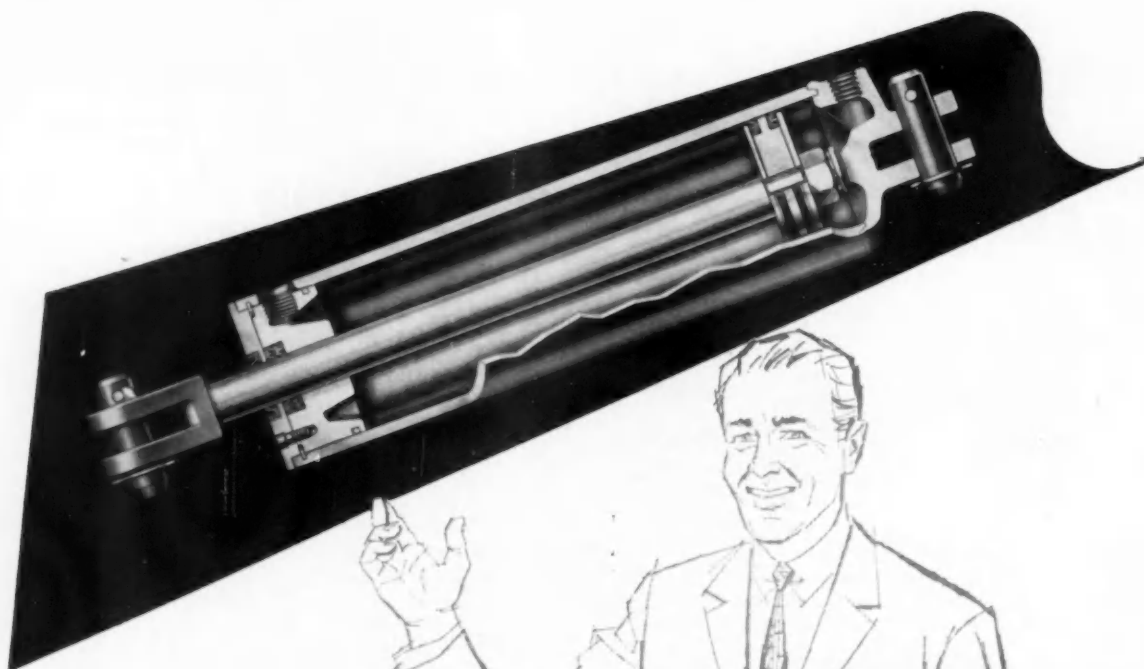


327-R

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AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE PUBLISHED SEMI-MONTHLY

JULY 15, 1958

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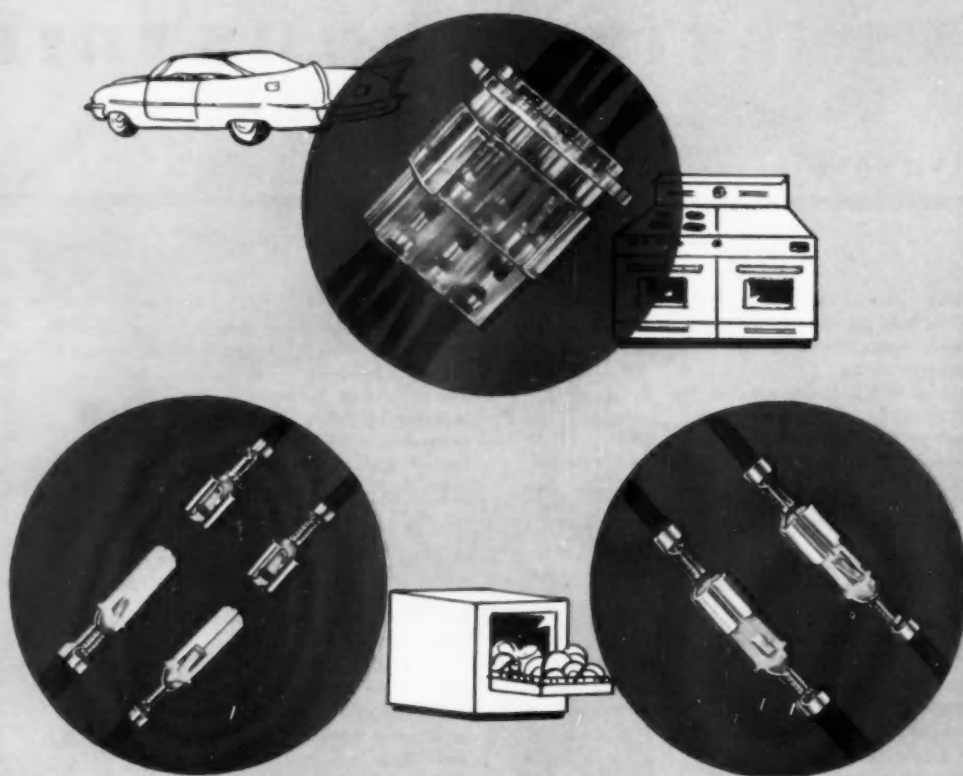


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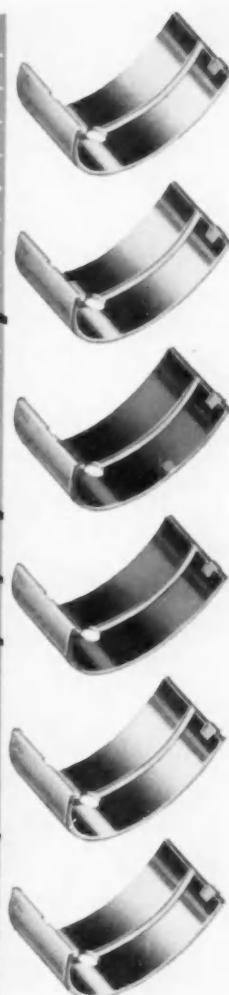
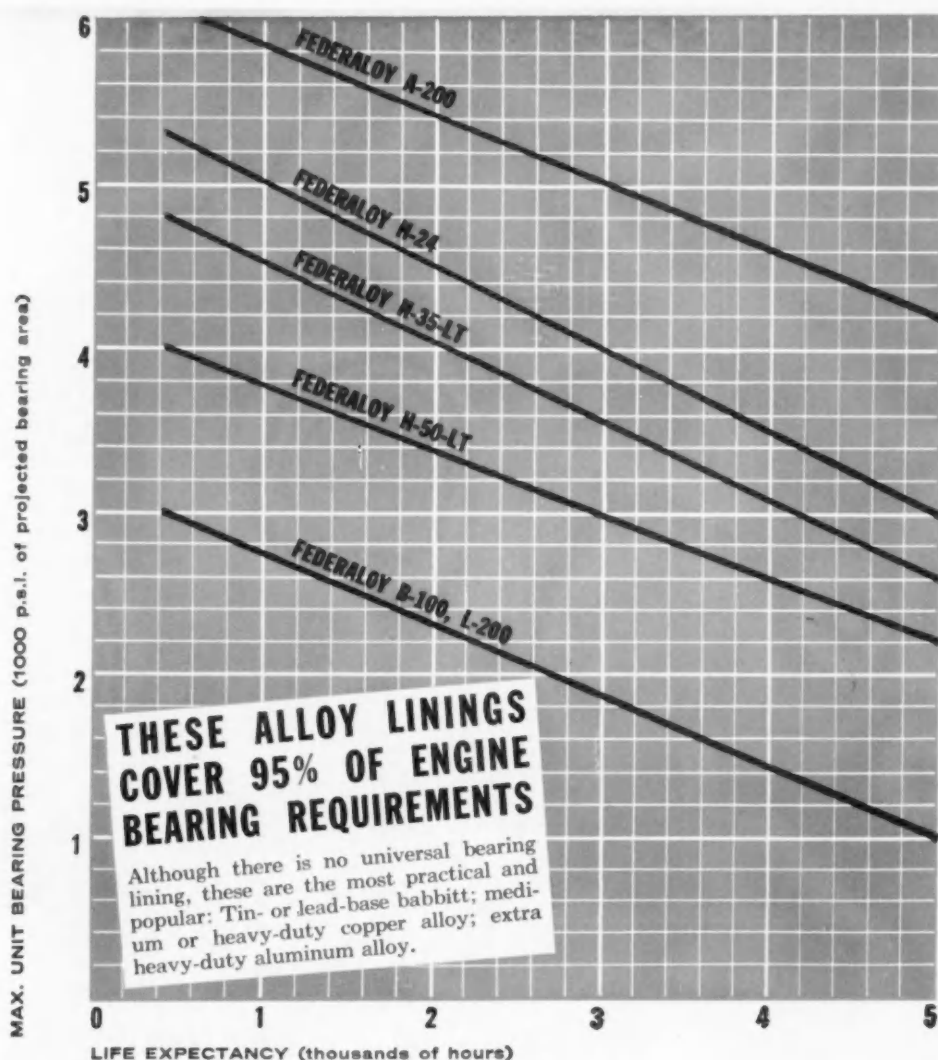
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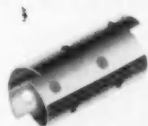
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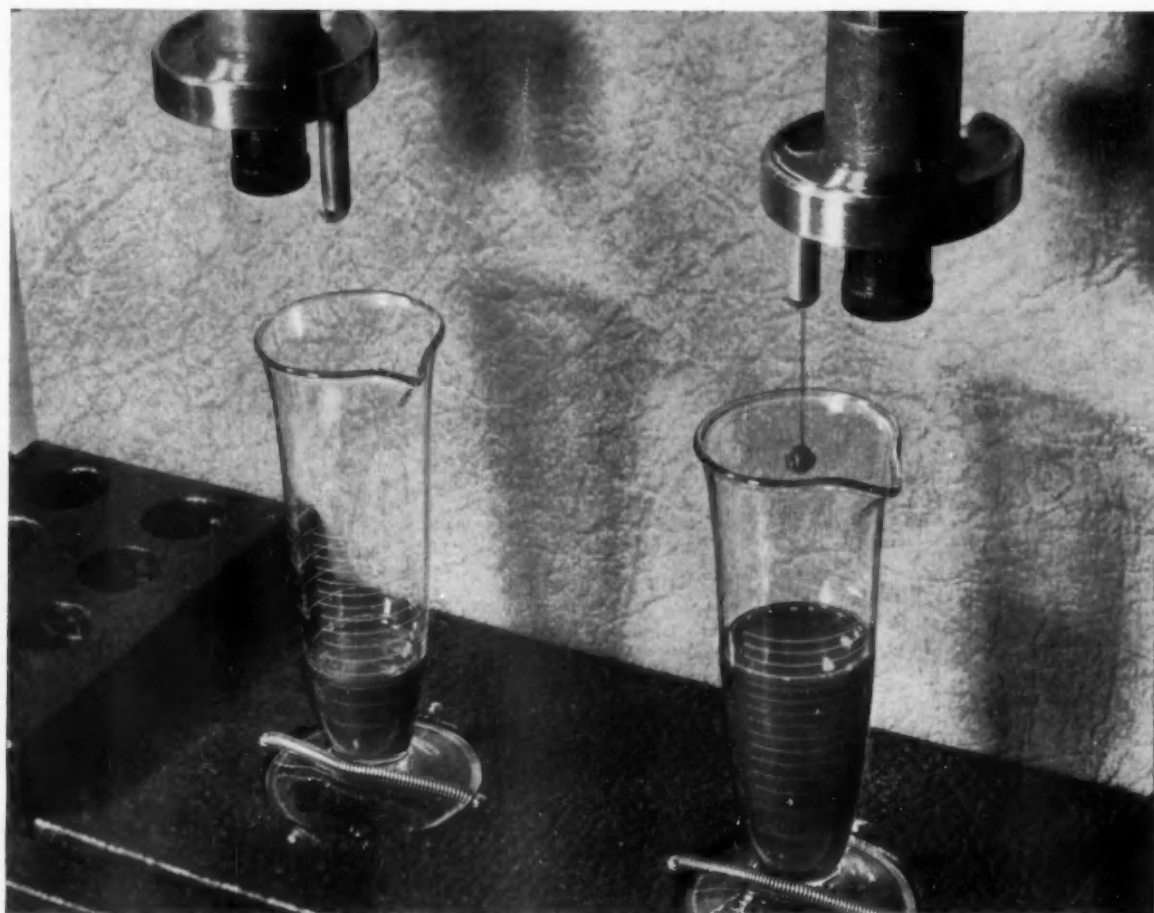
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AUTOMOTIVE INDUSTRIES, July 15, 1958



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4

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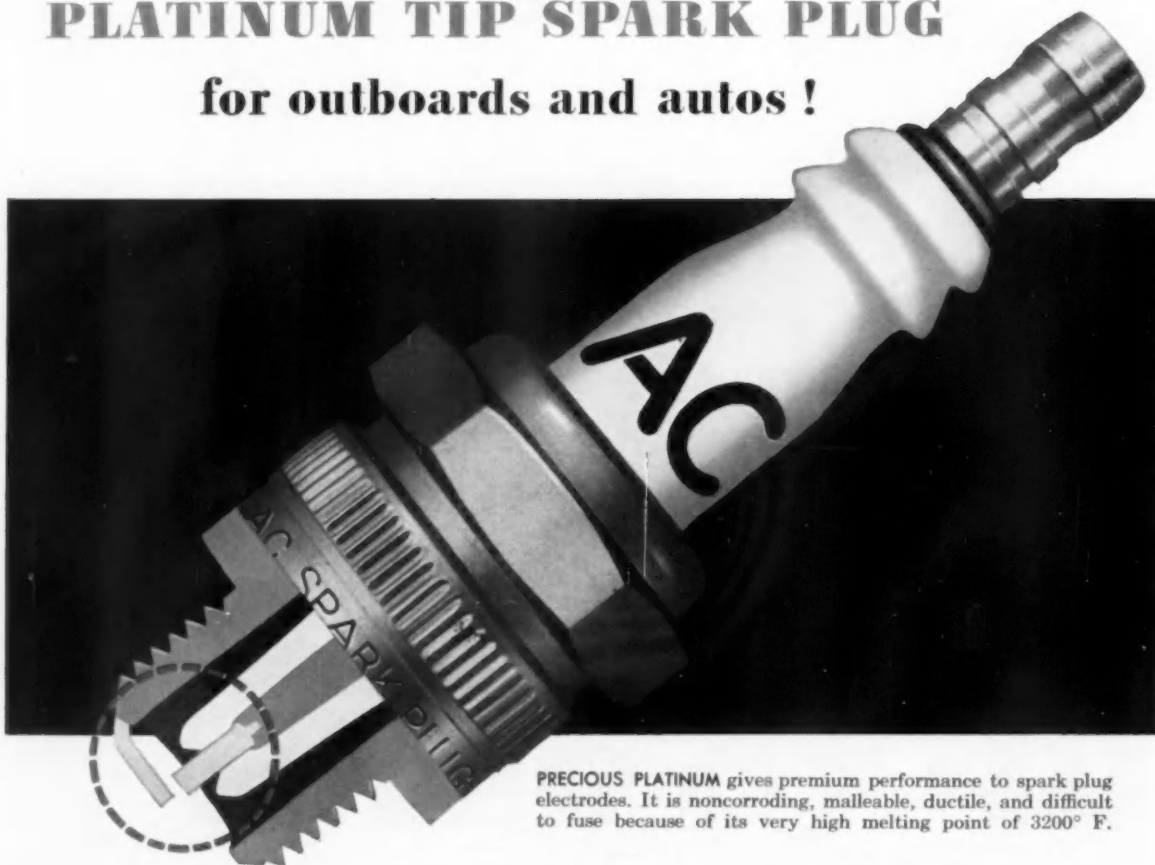
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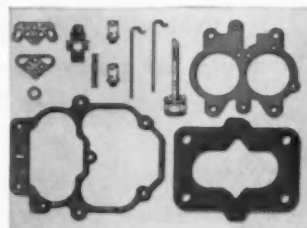
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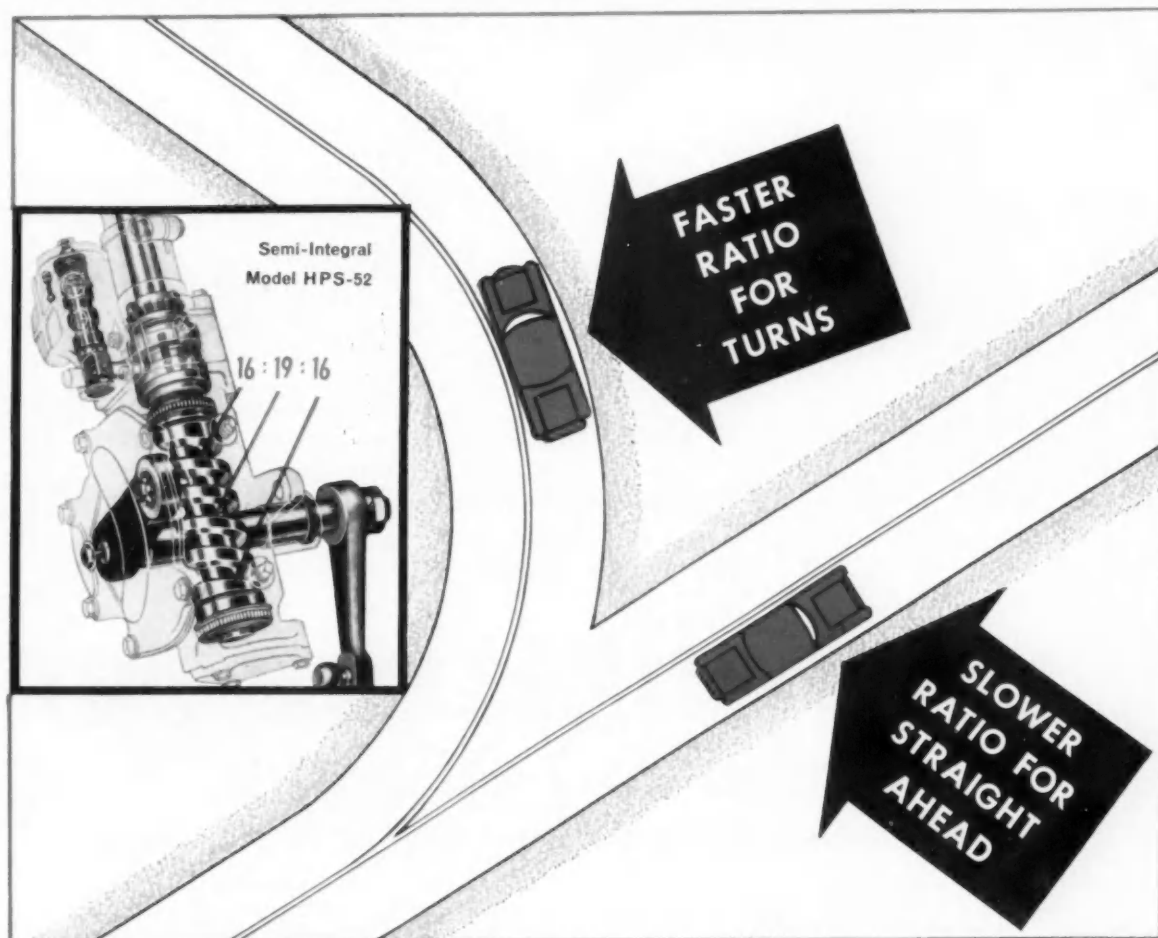
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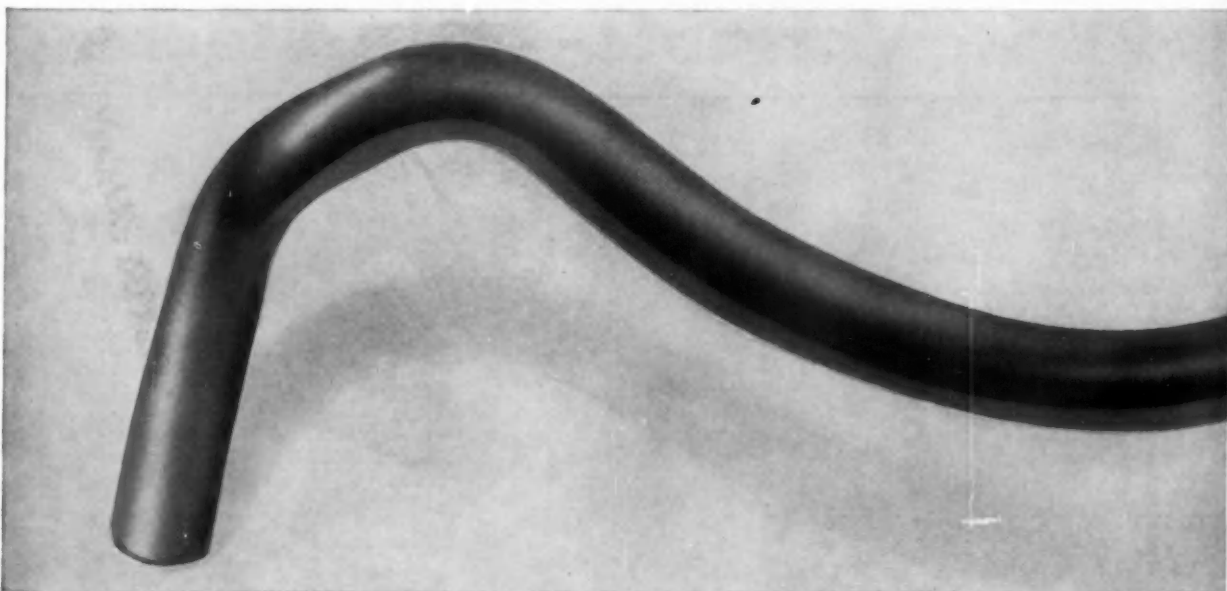
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BUNDYWELD...BENT

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GROOVED	DOUBLE-FLARED	COILED	SWAGED	UPSET NOZZLE	NOTCHED	BIFURCATED	PRECISION-GROUND	SLOTTED
								
SHEARED	FLANGED	PIERCED	BEADED	SOLDERED	BENT TO SMALLEST RADII	FLATTENED END CLOSURE	EXPANDED	DOUBLE UPSET

Shown above are but a few of the fabrication operations possible with Bundyweld Steel Tubing. Many of these—and others not shown—were developed through solving

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continuously rolled twice around laterally into a tube of uniform thickness, and



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Double-walled from a single steel strip, Bundyweld withstands high pressures and vibration fatigue. No wonder it's on 95% of today's cars, in an average of 20 applications each.

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of a product. Many times they can point out money-saving shortcuts.

With Bundyweld, there's no such thing as an "impossible" bend. And Bundy can turn out tubing parts by the millions . . . package them with care, and deliver them right on schedule.

Check first with Bundy—where you get dependable Bundyweld Tubing plus unmatched design and fabrication services. Bring your tubing problems to Bundy. Call, write or wire us today!

BUNDY TUBING COMPANY, DETROIT 14, MICHIGAN

WORLD'S LARGEST PRODUCER OF SMALL-DIAMETER TUBING • AFFILIATED PLANTS IN AUSTRALIA, ENGLAND, FRANCE, GERMANY, AND ITALY

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Bundyweld nickel and Monel tubing are sold by distributors of nickel and nickel alloys in principal cities.



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BEARINGS

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Contains valuable engineering data, formulas, tables, design application drawings, shaft and housing fits, lubrication helps, etc. in a compact, readily accessible unit.

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Precision dimensions held to exact tolerances guarantee press fit without effort or adjustment. Bearings received in perfect, factory-fresh condition, require no cleaning—no checking or inspection. Simply remove from carton, strip off the protective wrapper and install.

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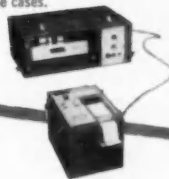
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Permits convenient, variable speed editing and study of Sanborn charts and other types up to 16" wide, 200 ft. long. Single control for direction, paper speeds (15" to 100"/min). Transparent cursor slides left or right, adjusts for accurate alignment with coordinates.

1- TO 8-CHANNELS, 12 PLUG-IN PREAMPLIFIERS 150 SERIES



Features of the "150 series" direct writers include: frequency response to 100 cps; linearity 1% overall; inkless recording in true rectangular coordinates by heated stylus on plastic coated Permapaper charts; current feedback driver amplifier and regulated power supply for each channel. Recorder has 9 chart speeds, 0.25 to 100 mm/sec; individual stylus heat controls, time-code marker. Up to 6-channels can be housed in one vertical cabinet. Amplifiers, recorder also available in individual portable cases.



6-, 8-CHANNELS, FLUSH FRONT RECORDER, FREQUENCY RESPONSE TO 120 CPS 350 SERIES



New "350" series direct writers with compact plug-in preamps in modules of up to 4; individual power supplies; current feedback transistorized power amplifiers; limiter circuit ahead of power amplifiers; velocity feedback galvanometer damping; enclosed galvanometers. Linearity 0.2 div over entire 50 divisions. Recorder-power amplifier-power supply package has 0.1 volt/div. sensitivity, can be used separately; pushbutton controls for 9 chart speeds 0.25 to 100 mm/sec; individual stylus heat controls; contacts for remote control; inkless rectangular coordinate recording on Permapaper charts.

6-, 8-CHANNELS 850 SERIES



Compact "850" series direct writers use 7" high plug-in preamplifiers in modules of up to eight and "350" flush front recorder package with transistorized power amplifiers, power supply; features velocity feedback galvanometer damping, linearity 0.2 div. over entire 50 divisions, 9 chart speeds from 0.25 to 100 mm/sec controlled by electric push-buttons; inkless recordings on Permapaper charts. Available preamps include Servo Monitor (demodulator) and DC Coupling. Carrier, Chopper Stabilized and Low Level types are in development.

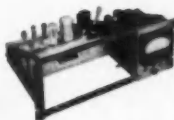
COMPUTER READOUT ... AUTOMATIC PROGRAMMING 150 SERIES

"150 series" 6-, 8-channel consoles in 46 1/2" high mobile cabinet. Dual-Channel Amplifiers have selectable sensitivity from 0.01 to 10 volts/div., internal calibration 2 volts \pm 1% freq. response flat to 20 cps. Optional Programmer sequences system operation in 20 steps, including recorder turn-on, calibration, computer DC level reading, recording for pre-set time, turn-off and reset.



PORTABLE INDICATORS FOR STRAIN, ETC.

Model 150-300/700 Wide Band Amplifier and Power Supply accepts "150" series preamplifiers — for use with low power galvanometers, oscilloscopes, panel meter. Freq. range DC to 10,000 cps (but limited by particular preamp range). Panel meter has center zero scale, 25 divisions each side of center.



SELF-CONTAINED UNIT PREAMPLIFIERS TO DRIVE OSCOPES, OPTICAL OSCILLOGRAPHS, TAPE RECORDERS, ETC.

Portable "350" series include Carrier, DC Coupling Servo Monitor (demodulator), True Differential DC types; others in development. Mount in portable "450" cases or in four-unit modules in 19" frame. Use individual power supplies. One "450" case and power supply can serve any "350" Preamp.



ALL DATA SUBJECT TO CHANGE WITHOUT NOTICE

For complete data, call your local Sanborn Engineering Representative or write the Industrial Division in Waltham.

SANBORN COMPANY

Industrial Division

175 Wyman Street, Waltham 54, Mass.

Continental "S" Assemblies Cut Costly Down-Time



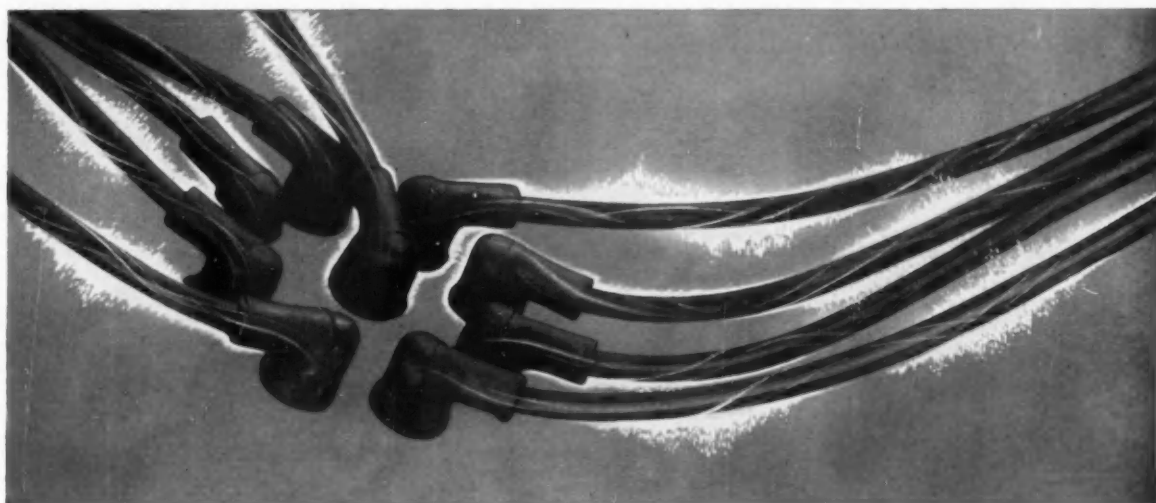
Every model in Continental's broad line of transportation engines is now available in "S" Assembly form—basic engine complete with cylinder-and-block assembly, oil pan, cylinder head, piston and valve assemblies, crankshaft, camshaft, gear cover, bearings and caps, crank and cam gears, and front end plate, fully assembled and torqued to specifications, ready to drop under the hood in an absolute minimum of time . . . An "S" Assembly usually costs less than the full overhaul it supplants, but the clinching point in its favor is the saving it effects in costly time out of use. Whether you operate a single unit or a fleet, it will pay you to investigate. Write for information.

1. The buyer of a Continental "S" assembly receives full benefit of the advanced practices which maintain quality in new engines. Here spectrographic analysis is used to assure uniformity of quality.
2. Here gears are checked to plus-or-minus .0003, on the involute checker, while results are recorded on a continuous chart.
3. Live steam under high pressure removes all foreign matter from inside engine block.
4. End play is checked, and all lines are oil tested, just as in new engine assembly. Then bearing caps, cylinder heads, gear covers, and filler blocks are all torqued to specifications.
5. After final inspection, the "S" assembly is coated with a preservative and encased in a polyethylene bag ready for shipment.

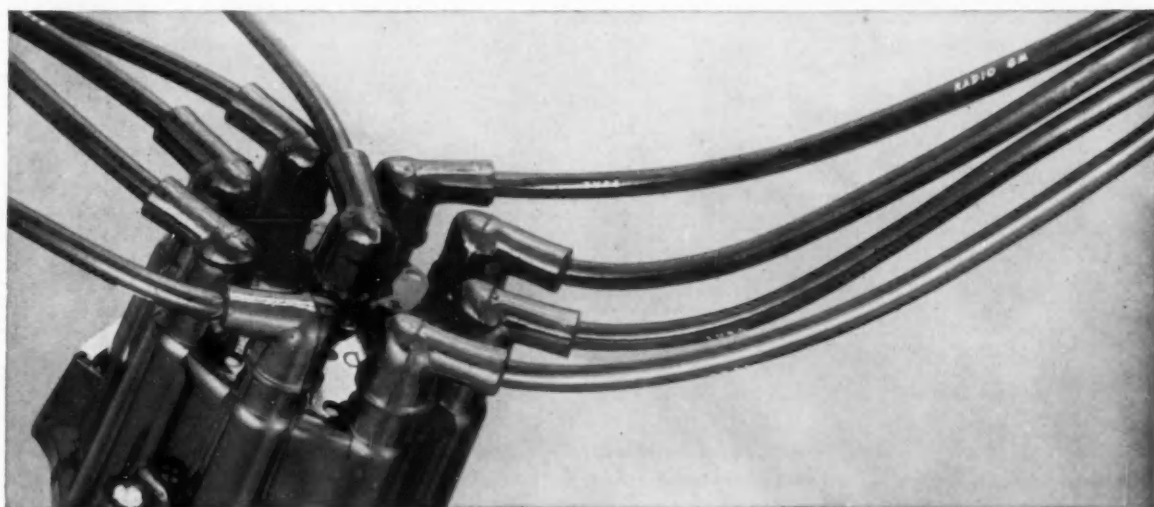


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DON'T / "broadcast" trouble through ordinary ignition cable!



DO / suppress Radio-TV interference with Packard T.V.R.S. cable!

Packard Electric's exclusive T.V.R.S. cable carries the electricity that makes the ignition spark, while it simultaneously stops interference.

Thus, using *only* Packard T.V.R.S. cable, you successfully stop "broadcasting" ignition interference, which can drastically affect operation of car radios and neighboring TV sets. By distributing resistance over the entire wiring circuit, T.V.R.S. cable does a more effective suppression job than can be done any other way.

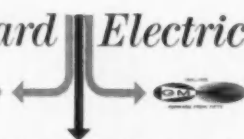
T.V.R.S. cable makes spark plugs last longer, too. The non-metallic conductor reduces electrical oscillations which cause spark plug electrode erosion.

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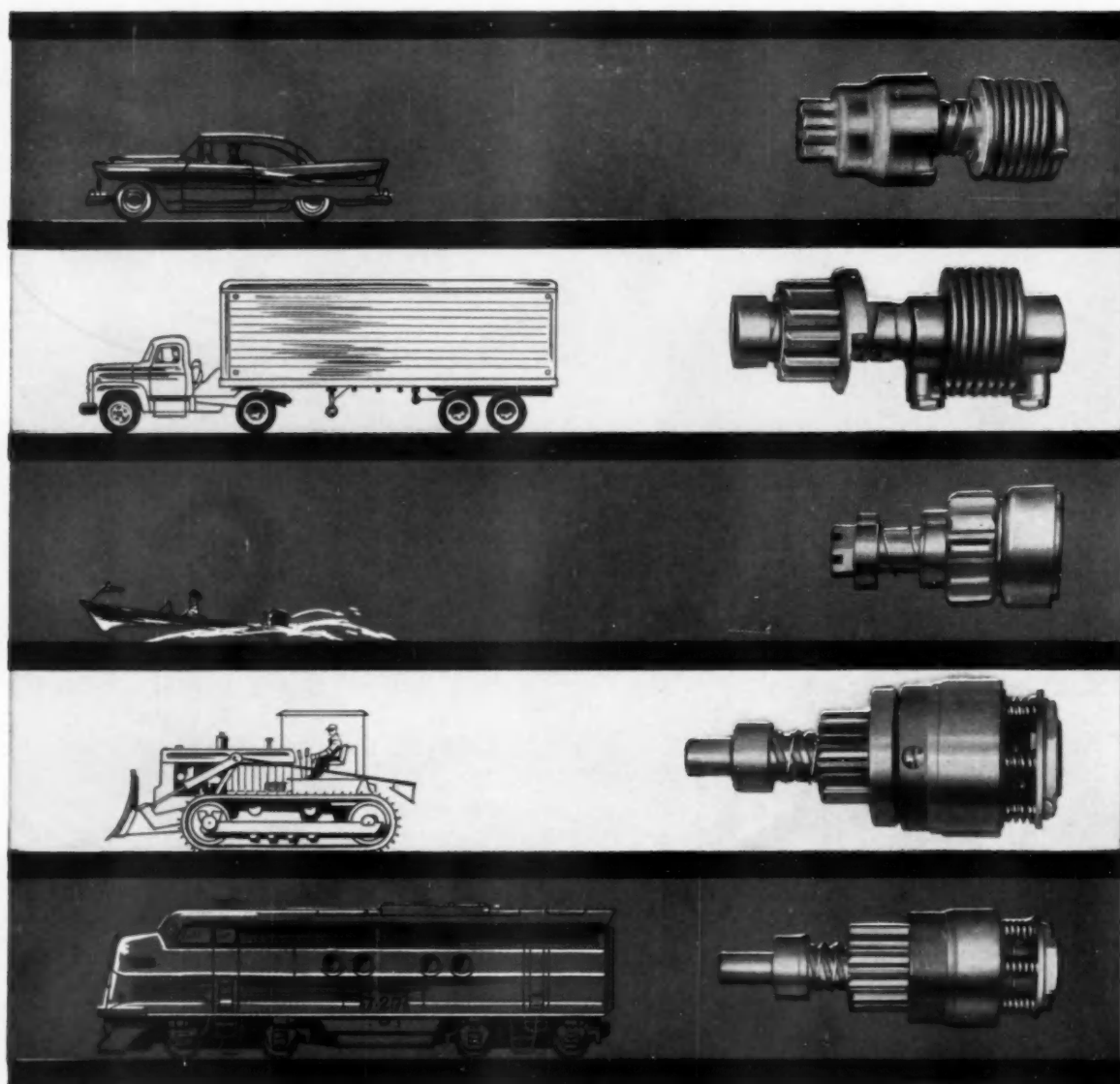
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Warren, Ohio



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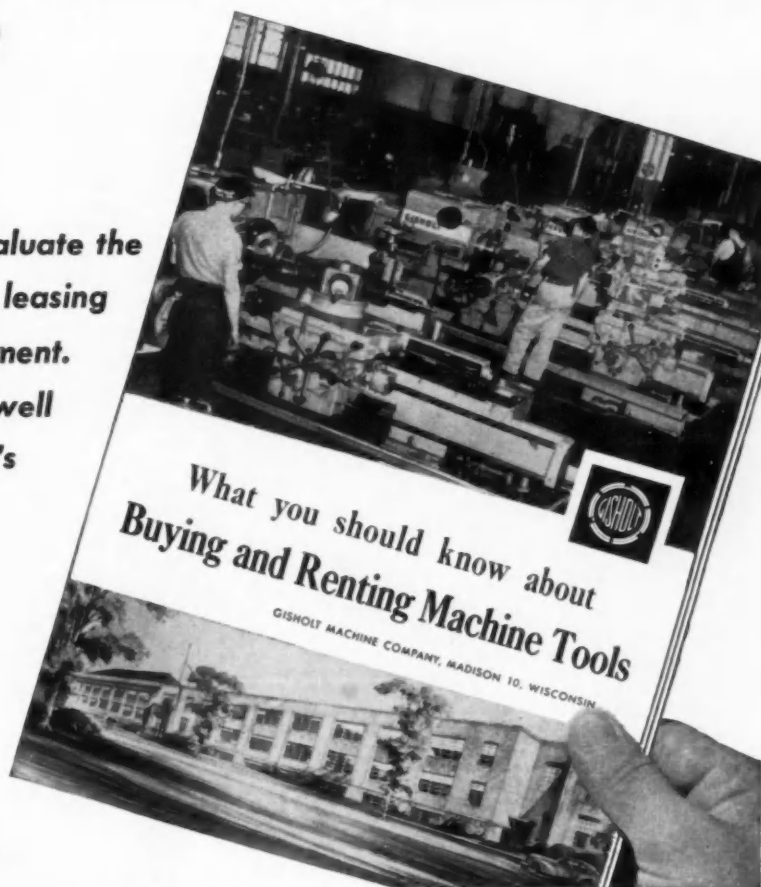
Bendix-Elmira, N.Y.

ECUPE MACHINE DIVISION



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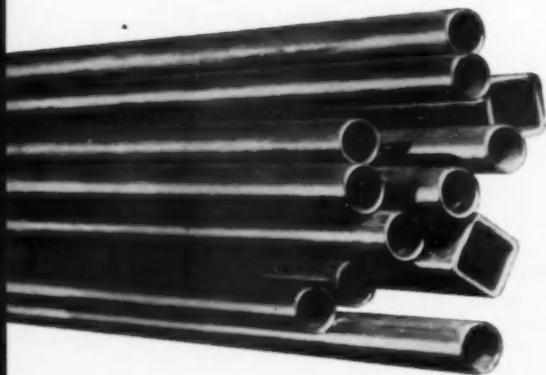
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City.....Zone.....State.....

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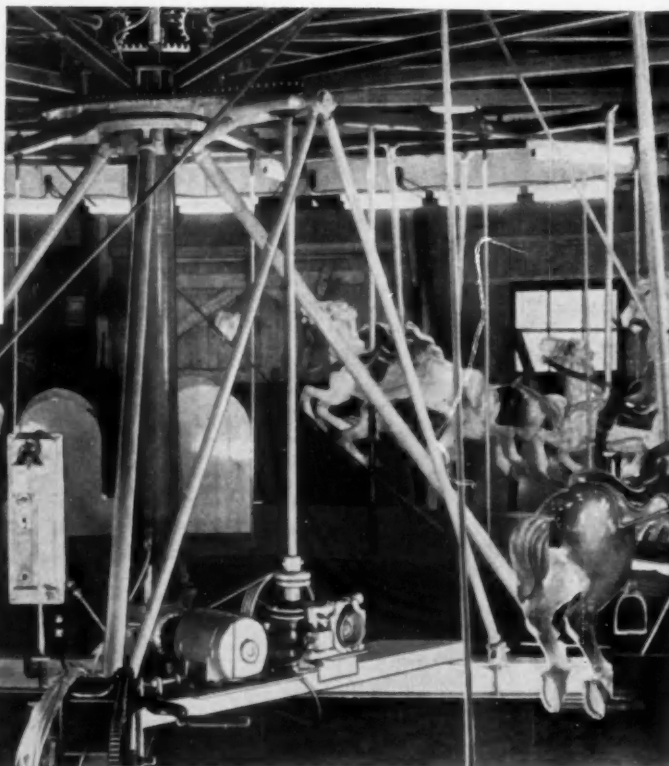
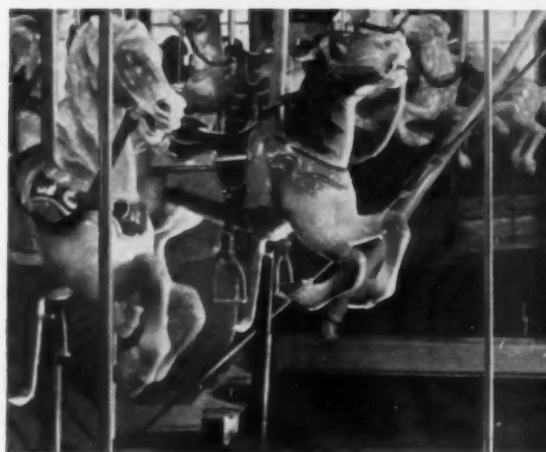
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Republic ELECTRUNITE Tubing fabricates easily, economically, with uniformity. It is available in a wide range of sizes and provides uniform wall thickness, ductility, concentricity, diameter, and other physical and mechanical properties in flanging, flaring, bending, expanding operations.

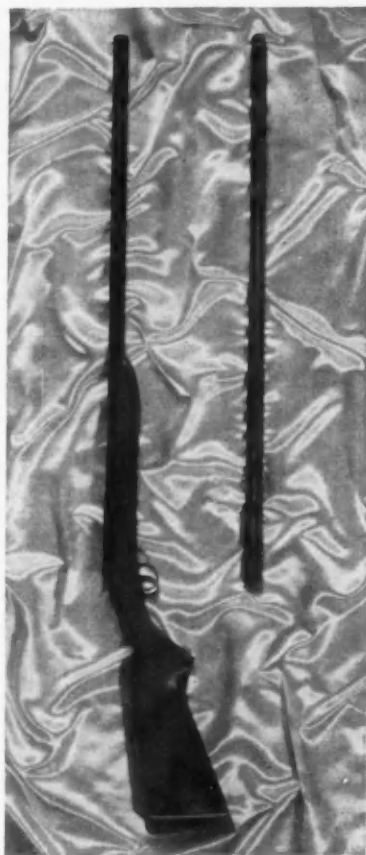
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CALENDAR OF COMING SHOWS AND MEETINGS

Fifth Annual Symposium on Computers and Data Processing, Albany Hotel, Denver, Colo. July 24-25

Annual Sales Conference of National Machine Tool Builders' Association and American Machine Tool Distributors Association, Purdue University, Lafayette, Ind. July 28-Aug. 1

American Society for Quality Control, Western Region annual conference, El Cortez Hotel, San Diego, Calif. Aug. 7-8

SAE National West Coast Meeting, Ambassador Hotel, Los Angeles, Calif. Aug. 11-14

American Petroleum Institute, OIC Steering Committee meeting, Hotel Statler, Boston, Mass. Aug. 14

American Astronautical Society, Inc., Annual Western Regional Meeting, Stanford University, Dinkelspiel Auditorium, Palo Alto, Calif. Aug. 18-19

Joint Heat Transfer Conference of ASME-AICHE, Edgewater Beach Hotel, Chicago, Ill. Aug. 18-21

Western Electric Show and Convention, Pan Pacific Auditorium, Los Angeles, Calif. Aug. 19-22

Society of British Aircraft Construction, flying display and exhibition, Royal Aircraft Establishment, Farnborough, England Sept. 1-7

American Petroleum Institute, Oil Information Committee, meeting, Hotel Statler, Boston, Mass. Sept. 3-5

International Conference on Air Pollution, sponsored by ASME, Hotel Statler, New York, N. Y. Sept. 4-5

International Aviation Show, Coliseum, New York, N. Y. Sept. 6-14

SAE National Farm, Construction, and Industrial Machinery Meeting, Milwaukee Auditorium Milwaukee, Wis. Sept. 8-11

First International Skid Prevention Conference, sponsored by University of Virginia, Charlottesville, Va. Sept. 8-12

First International Congress of Aeronautical Sciences, Palace Hotel, Madrid, Spain Sept. 8-13

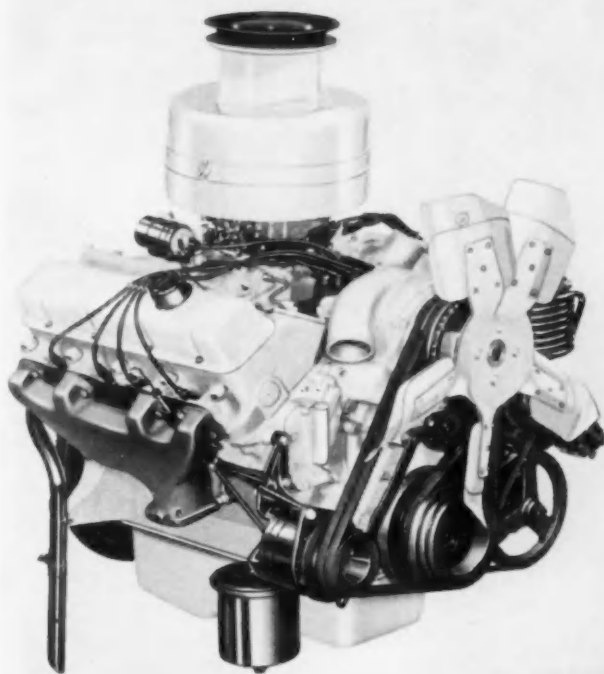
Second International Congress on Air Pollution, sponsored by ASME, Hotel Statler, New York, N. Y. Sept. 9-10

National Petroleum Association, 56th annual meeting, Hotel Traymore, Atlantic City, N. J. Sept. 10-12

Instrument-Automation Conference, 13th annual meeting, sponsored by Instrument Society of America, Convention Hall, Philadelphia, Pa. Sept. 15-19

Material Handling Institute, Inc. fall meeting, The Greenbrier, White Sulphur Springs, W. Va. Sept. 22-24

Standards Engineers Society, 7th annual meeting, Benjamin Franklin Hotel, Philadelphia, Pa. Sept. 22-24



HYPALON® ignition harness designed for fewer repairs on new Ford commercial engine

To power its new heavy-duty trucks, the Ford Motor Company has developed a new engine which is designed throughout to operate longer with minimum repairs. In keeping with this objective, Ford engineers specified HYPALON-jacketed ignition wire. Because of its increased resistance to under-hood conditions, HYPALON is expected to significantly reduce maintenance and replacement costs.

HYPALON jacketing is being used mainly because Ford succeeded in obtaining higher horsepower from a compact engine. This created the problem

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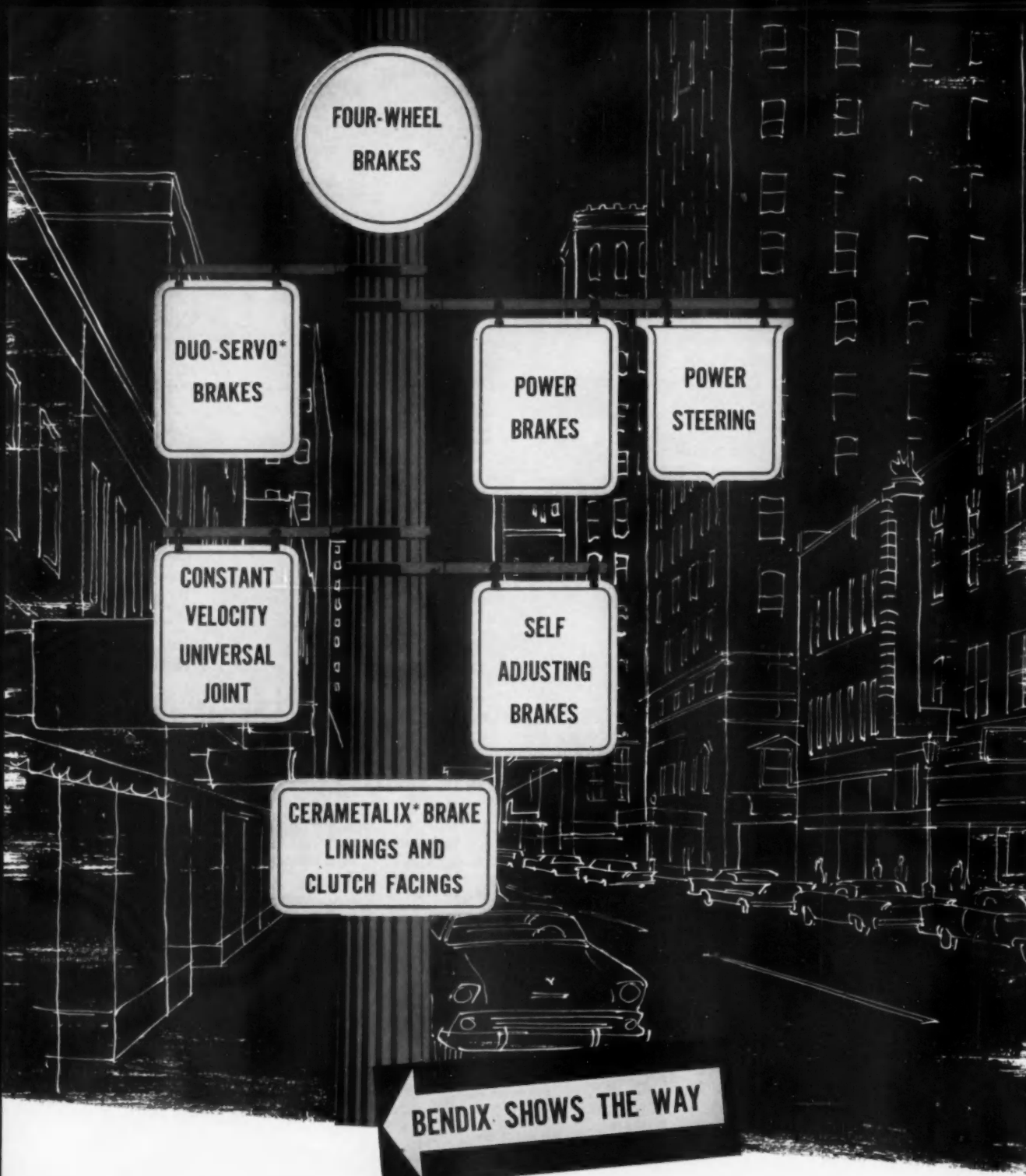
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High Spots of This Issue

▼ Panel Hoods Produced on Mechanical Lines

To step up production of outer and inner hood panels for 1958 models, Pontiac Motor Div. added several large presses as well as other equipment. Included in the new setup is a system that virtually eliminates manual handling. Page 50.

▼ Automotive and Aircraft Uses of Tin

This comprehensive survey of the uses of tin in automobiles and aircraft stresses the fact that the real importance of this metal lies not so much in the quantities used, but rather in the number of essential purposes it serves. Page 54.

▼ Mack Modernizes Facilities

Two modern production facilities for turning out truck cabs and axle shafts have been installed by Mack Trucks, Inc., at the company's main assembly center in Allentown, Pa. This article covers both lines. Page 60.

▼ English Ford Plant

This description of the new \$20-million Thames Foundry plant built by English Ford more than justifies the company's claim that it is more highly automated than anything in Europe and comparable with the most modern U. S. plants. Page 64.

▼ Frame Production Lines at A. O. Smith

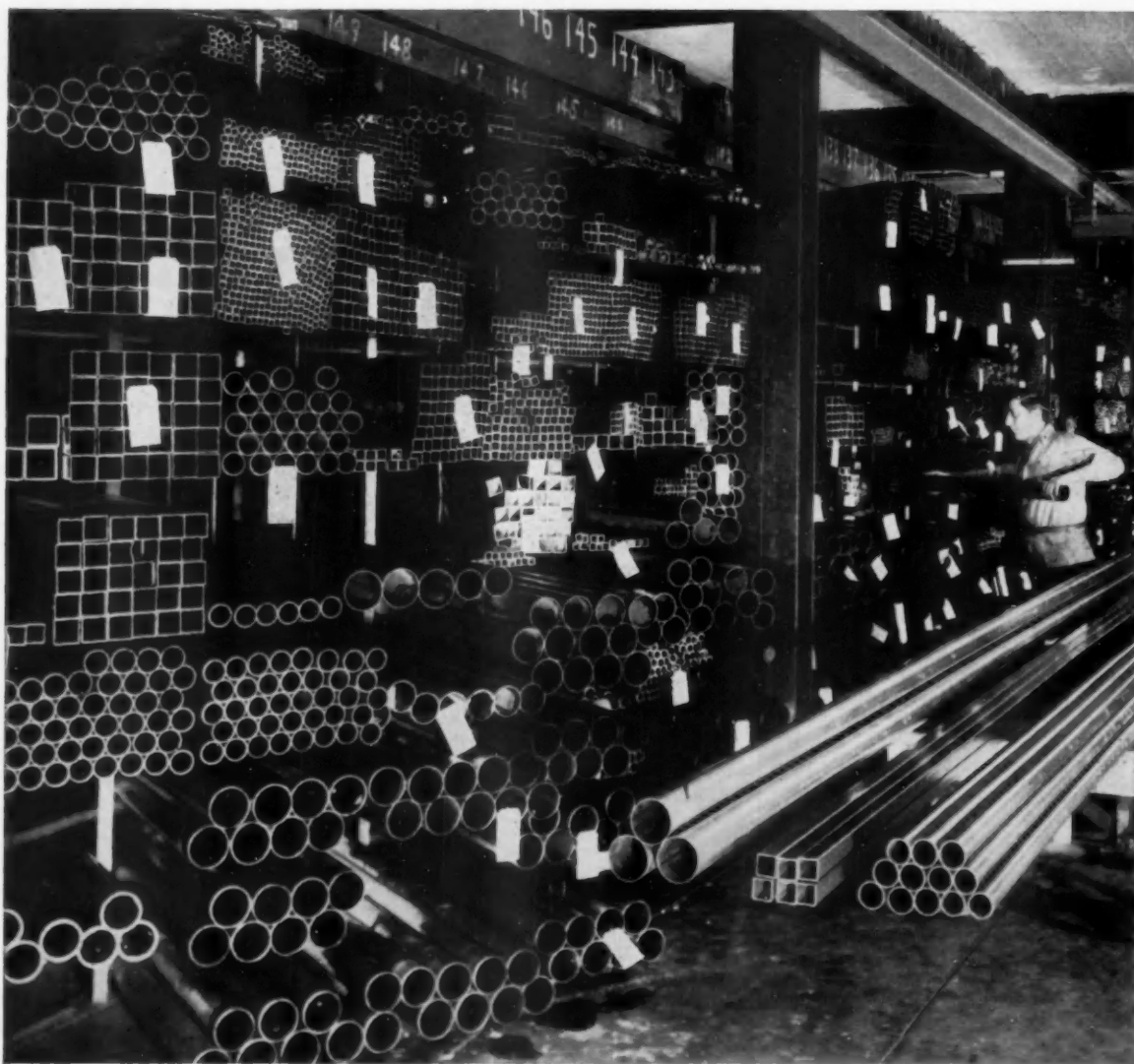
A. O. Smith operates a completely automatic plant at its automotive division in Milwaukee to turn out automotive frames. How the company has utilized the best of modern technology at this facility to hold down costs is told here. Page 66.

▼ 30 New Product Items

And Other High Spots, Such As:

Hardening automotive parts; powder metallurgy in USSR; coated abrasive machinery show; news of machinery industries; production control equipment; rocket engines; and industry statistics.

AUTOMOTIVE INDUSTRIES COVERS
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News

OF THE AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 119, No. 2

July 15, 1958

Contract Talks Begin at S-P, Lag at Big Three Companies

Contract renewal talks between Studebaker-Packard Corp. and the United Auto Workers union began July 1 as negotiations between the union and the Big Three companies bogged down for the Fourth of July week end.

S-P's contract with the UAW is due to expire Sept. 1.

As June ended and the holiday approached, Ford, Chrysler and General Motors continued to operate without union contracts, although the going was not too smooth. Their contracts had expired at the beginning of June.

There were few, if any, signs of progress as the talks recessed for the holiday until July 14, indicating a settlement was not in the offing. It seemed likely, however, that one of the companies would make the union an offer in the near future.

Hope of a settlement before 1959 production got under way disappeared when Buick announced it would begin '59 component production July 7. Full-scale car output at Buick and other manufacturers, however, still was at least six weeks away.

The month of June was not without friction. Auto companies charged workers with sabotaging production (punctured bodies, sugar in gas lines). Wildcat strikes plagued Chrysler Corp., particularly the Sterling Twp. missiles plant near Detroit and the Plymouth body operation. Other incidents cropped up to increase the pressure.

American Motors' contract expired June 15, but the company and the union agreed to an extension with a clause that either party could cancel on 10 days' notice. Negotiations continued through June on a limited basis.



SLIDING ROOF OPERATED BY PUSH-BUTTON CONTROL

Sliding roofs, built by Golden Body Parts Div. at Detroit, can be installed in both American and foreign cars by authorized body plants in the U. S. Roofs are available in two types: a metal panel that slides back inside the top; and a folding fabric type, such as the one shown here on a 1958 Chevrolet Impala, which folds as it slides back and can be locked in any position from closed to completely open. Both types can be automatically or manually operated.

Chevrolet Building Warehouse To Serve Three GM Divisions

A new 130,000 sq ft zone office and master warehouse to serve Chevrolet, Oldsmobile and Pontiac dealers in the Rocky Mountain area is being planned by Chevrolet Motor Div. The warehouse, which will serve 850 dealers, will be built at Denver and completed in the spring of 1959.

Buick Gets Off to Early Start On Production of 1959 Models

Buick Motor Div., disappointed with its showing during the past model year, already has ended production of '58 models and begun manufacturing components for next year's car. As-

sembly is scheduled to begin Aug. 18.

Buick shut down June 27 for inventory and changeover. On July 7 component production began, and most of the manufacturing plants are slated to be back in operation before the end of July.

Total output of 1958 Buicks was 241,892 units. For the first six months of this year production was 133,095 units, compared with 293,000 during the same period a year ago. Shut-down on '57 model production did not come until mid-September.

Buick was just the first of the early closers this year. Virtually all '58 production is scheduled to wind up earlier than last year, with the middle-price field closing out first.



Overall view of Republic Steel Corp.'s "bar mill of tomorrow."

Brazil Buys Record Total Of Industrial Lift Trucks

The Brazilian government has ordered 572 Yale industrial lift trucks, according to an announcement by Elmer F. Twyman, vice-president of Yale & Towne Mfg. Co.

Mr. Twyman said this is the largest single export order for fork lift trucks ever received by an American materials handling equipment manufacturer.

The purchase, made with the help of an Export-Import Bank loan, is part of a port modernization program being carried out in Brazil. A total of 18 ports will be supplied with the trucks, Mr. Twyman said.

The entire order consists of Yale KGP51, gasoline-powered trucks of 4000 lb capacity, most of them equipped with fluid coupling. All units have 92-in. high lifting masts with maximum lifts of 144 in.

AMC Profit for Third Quarter Expected to Top \$5 Million

American Motors' president George Romney expects his firm's profit for the third fiscal quarter of 1958 will top \$5 million, making total net earnings of \$12.3 million for the first nine months. AMC's third period ended June 30.

In the wake of news stories about stock sales by one-time major stockholder Louis E. Wolfson, Romney said his company will have more than enough cash and securities to pay off its bank indebtedness of \$5 million.

Two years ago, he said, the company owed the banks \$58.4 million and one year ago bank debts totaled \$33.7 million.

Romney credits increased Rambler sales for his company's financial success this year. Earlier, he had predicted a loss for the current (fourth) quarter due to model changeover costs, although the second half should still show a profit.

In the first nine months a year ago, AMC reported a loss of \$6.4 million.

Meanwhile, Wolfson has been charged with violating the Securities Exchange Act by attempting to influence the price of AMC stock through "misleading" statements to the press. He has denied all charges. At one time, Wolfson and his family owned up to 460,000 shares of AMC, but he now has sold all of his holdings.

A hearing on an SEC request for an injunction against Wolfson has been set for Aug. 5.

AMC stock has been among the most active on the market during the last nine months.

In other automobile financial news, Chrysler Corp. disclosed it was arranging a revolving credit of \$150 million "to anticipate short term credit requirements that may arise" during the next few years.

With some 100 banks participating, the agreement runs from July, 1958 through Sept., 1961. Financial vice-president F. W. Misch said the corporation has no plans to borrow under the agreement this year.

Republic Steel Unveils "Bar Mill of Tomorrow"

Republic Steel Corp. unveiled a steel bar mill described as the most advanced now in operation in the American steel industry.

T. F. Patton, Republic Steel president, said the \$18 million "Bar Mill of Tomorrow" erected at South Chicago, Ill., as part of Republic's three-year, \$200 million expansion program, will provide "high quality, hot rolled bar products, including very heavy bar coils, thus enabling the company to compete in several new market areas."

After a break-in period of a few months, the facility will be operated almost entirely on an automated basis, the company expects. Only six employees are needed to control the actual operation of the mill. Altogether, the mill employs about 200 workers, most of them for service and maintenance.

The quarter-mile-long, straight-away mill consists of 16 alternately placed vertical and horizontal mill stands in which alloy and carbon steel billets are reduced to finished bar products— $\frac{3}{8}$ to $1\frac{1}{4}$ in. in diameter—at the rate of 3000 fpm.

Four anti-friction mill bearings in each stand—operating in an enclosed oil bath—give rigidity to the mill housings. This affords minimum roll deflection and close control over the dimensions of the steel.

Each of the 16 mill stands is individually motor driven, and this arrangement together with an electronic control system allows accurate speed control and synchronization as the steel travels from stand to stand.

Colbert Elected President Of Automobile Manufacturers

L. L. Colbert, president of Chrysler Corp., has been elected president of the Automobile Manufacturers Association, succeeding George Romney to the two-year term. Colbert had been serving as vice-president of the AMA passenger car division.

Henry Ford II, president of Ford Motor Company, is the new passenger car vice-president and J. N. Bauman, president of White Motor Company, succeeds E. J. Bush of Diamond T. Motor Company as vice-president of the commercial car division.

P. O. Peterson, president of Mack Trucks, Inc., succeeds Bauman as treasurer. Harlow A. Curtice, president of General Motors, continues as secretary, and Harry A. Williams, who took over last November, continues as managing director.

Ford F-600 Trucks Available With Perkins Diesel Engine

Ford Motor Co. announced it will offer a new six-cylinder Diesel engine in its new 154-in. wheelbase F-600 trucks. The new engine was designed and built by the British firm of F. Perkins Ltd.

The trucks, built in the U. S., will be equipped with the Perkins F340 engine at various Ford Motor Co. assembly locations around the world, and the engines will be sold on a first equipment installation basis.

The Perkins F340 develops 110 bhp at 2850 rpm and has a maximum torque of 240 lb ft at 1700 rpm. It has a 4 in. bore, 4.5 in. stroke, a displacement of 339.3 cu in., and compression ratio of 17.5 to 1.

Features of the F340 include:

- A bigger in-line fuel pump of the A.A. type designed by C.A.V. Ltd.
- An automatic advance-retard device between the fuel pump and the exhaust which improves overall efficiency and gives smoother running.
- A timing drive incorporating an S.C.D. auto-tensioner. This works by hydraulic pressure from the engine oil supply and has a slipper face covered with synthetic rubber. Four nylon reaction pads are mounted inside the timing case wall to stabilize the chain.
- A large capacity water pump of new design bolted on the side of the cylinder block and thermostat housing specially adapted to Ford requirements.
- An altitude control providing automatic compensation of the fuel supply for engines operating at varying altitudes.

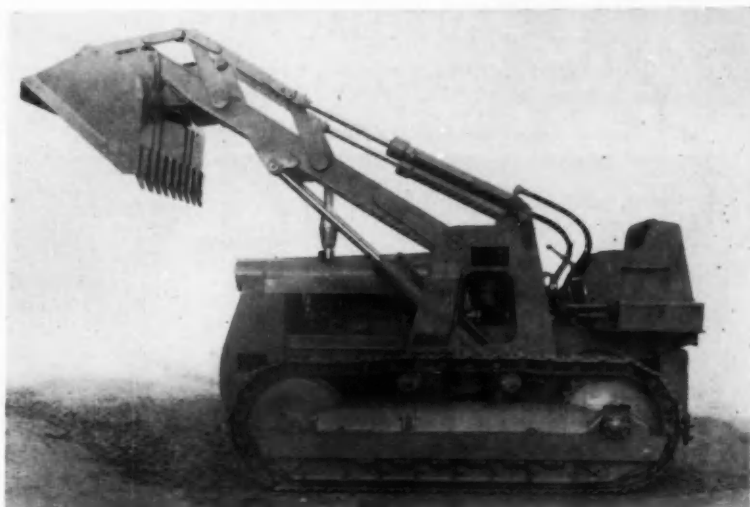
S-P Offers Twin Traction As Option on ¾-Ton Trucks

Studebaker-Packard Corp. is making its Twin Traction non-slip differential available as optional equipment on the Studebaker Transtar ¾-ton truck line. Previously the option was offered only in the half-ton line of trucks, although it has been available on S-P passenger cars since 1956.

Chrysler Military Orders Rise As New Contracts Are Awarded

Chrysler Corp.'s military contracts, bolstered by a \$72.8 million tank contract received in late June, now total nearly \$482 million.

The new contract calls for production of 900 medium tanks between Jan. 1, 1959 and March 31, 1960 at Newark, Del. with component manufacture at Scranton, Pa. and Centerline, Mich. Current tank contracts



FIAT TRACTOR-CRAWLER HAS MANY USES

This new Fiat tractor-crawler combination pulls agricultural implements and other off-highway equipment and can be equipped for a variety of jobs, such as earthmoving, clearing of trees, etc. It is powered by a four-cylinder Diesel engine that develops 70 hp at 1650 rpm and has a compression ratio of 15.5 to 1. Transmission has five forward speeds and reverse.

now amount to approximately \$142 million.

Chrysler's current missiles contracts, in excess of \$300 million, cover work on the Jupiter and Redstone missiles at the corporation's plant near Detroit. Chrysler, incidentally, now refers to this as the Sterling Twp. plant, abandoning the Warren designation used previously.

Current orders for tactical and commercial equipment for the military total nearly \$26 million. In addition, there is a \$14 million hold-over from 1957 contracts which are not covered by current orders.

Recently, the Army announced in Washington new contracts for both tank and missiles work amounting to nearly \$10 million in addition to the above. Until Chrysler officially receives the firm orders, however, these new contracts cannot be considered part of the corporation's total military backlog.

In 1957, sales of military products amounted to approximately \$125 million, or 3.5 per cent of Chrysler's total for the year. At the end of 1957 the defense backlog amounted to some \$300 million compared with \$100 million at the end of 1956.

Willys Negotiating with Rover On Possible Export Agreement

Willys Motors, Inc., already strong in the export field, has been holding discussions with Rover of England and other unnamed European car builders to investigate the advan-

tages of a "mutual cooperation" pact. So far no results have been announced.

Rover has a full line of passenger cars in addition to a utility vehicle similar to the Jeep. Rover's main business lies in the sterling area, of course, while Willys is strongest in dollar countries. A pact could benefit both companies with additional market outlets.

Kelsey-Hayes Sales, Net Drop In Third Fiscal Period of '58

Kelsey-Hayes Co. reported a drop in both sales and earnings in the third period of its fiscal year ended last May 31.

Sales for the quarter totaled \$40,954,472 and earnings were \$872,375, down from \$54,075,230 and \$3,133,969 a year ago.

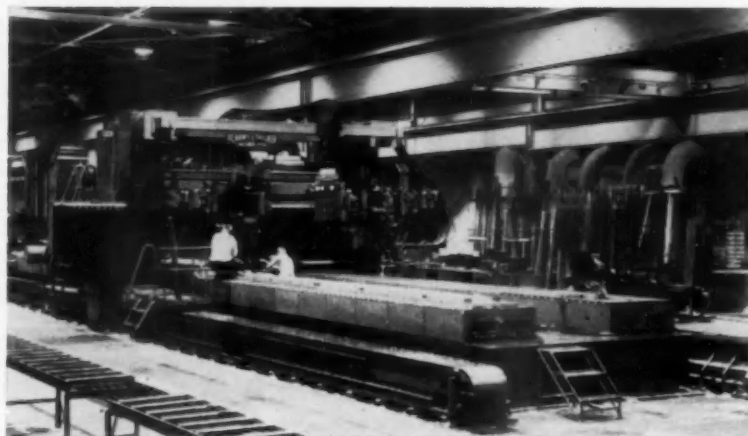
Checker Sets August Target For Passenger Car Production

Checker Motor Corp. has set the latter part of August as the new target date for production of its new passenger car designed for sale to the public. The car is not expected to be shown to the public however before October.

Powered by a Continental six-cylinder engine, the car will be similar to Checker taxicabs but different in appointment and options. More glass area, a new grille and interior trim will distinguish the car. Current price estimate is \$2350 at the factory.

News

AUTOMOTIVE AND AVIATION



BOEING COMPLETES RETOOLING FOR B-52G

Boeing Airplane Co. has virtually completed retooling for production of new B-52G Stratofortress bomber at its Wichita Div. plant. Shown here is one of three giant electronically controlled skin mills used in machining sculptured wing panels for the eight-jet bomber. Other tape-controlled machines now in operation include two automatic riveters and three profile mills. This is said to be the largest concentration of electronically controlled machine tools anywhere.

New Firm to Build Trailers For Fruehauf in Australia

A newly formed company will build a complete line of trailers for Fruehauf in plants at Sidney and Melbourne, Australia, with production scheduled to begin within three months.

The company, Fruehauf Trailers (Australasia) Pty. Ltd., is owned jointly by the parent trailer firm of Detroit and Clyde Industries Ltd., of Sidney. The firm will serve Australian and Asian markets.

Clyde Industries, with some 4000 employees in Sidney, makes locomotives, automobiles, railroad equipment, tools, and food processing machinery.

Nance Says Ford Car Imports Will Hit 12% of U. S. Total

Sales of English and German-built Ford passenger cars should account for 11.5 or 12 per cent of the total U.S. foreign car sales by the end of 1958, according to James J. Nance, vice-president of Ford Motor Company and general manager of the M-E-L. Div.

Nance, whose division handles domestic distribution of the European Fords, said the English Fords now account for 10.3 per cent of total imported car sales. The German Taunus,

introduced recently, still is sold on a limited basis by 15 East Coast dealers.

Since the M-E-L Div. was formed in January, 148 dealers have been franchised to handle the import lines. Most of these were Edsel, Lincoln and Mercury dealers. Nance attributes a sales gain of 136 per cent for the five-month period to the expanded dealer group.

Sales of the English Ford totaled 12,555 units in the five months, compared with 5313 a year ago. May sales of 2921 cars and light vans were the highest in the 10 years the English Ford has been imported.

Automobile Firms To Continue Major Role in Missiles Field

Automobile manufacturers will continue as major contractors in the growing missiles field, according to Gen. Nathan F. Twining, Chairman of the Joint Chiefs of Staff. But, as the military increases its missiles expenditures in the coming years, there will be relatively few newcomers to the missiles program.

Gen. Twining, in Detroit for a Industry Missile and Space Age Conference, said that the companies now in the missiles business can handle any future business. "We don't want too many in the field," he said, indicating that the armed forces would prefer to stick with the companies

who have proved themselves with existing contracts.

One reason for this, he explained, was the fact that the aircraft industry will drop off as missiles develop, leaving the giant aircraft firms with extra capacity for continued missiles work.

He said that within three years 40 per cent of the defense budget would go to missiles programs.

Earlier, Lt. Gen. C. S. Irvine, Air Force Deputy Chief of Staff, Material said the current AF ratio of manned aircraft to missiles is 99 to 1, but within 10 years the Air Force would be 60 per cent guided missiles.

Gen. Nelson M. Lynde, Jr., commander of the Ordnance Tank Automotive Command, said that one-fifth of the Army's budget for the new fiscal year, which began July 1, would go to the Army Ordnance Missiles Command in Alabama. He said that 85 per cent of the Army's budget would be spent with industry during the year.

Gen. Lynde emphasized, however, the importance of ground support equipment to the missiles program. Dollar value of ground support contracts is approximately equal to that of missiles contracts.

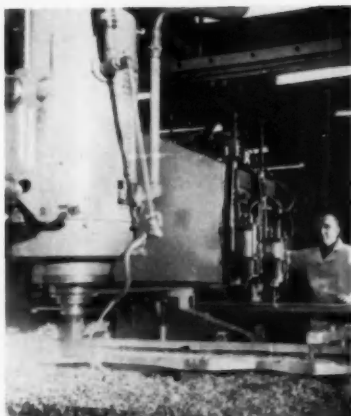
Bernard J. Meldrum, special assistant to the general manager of the Chrysler Missile Div., supported this by stating that the dollar value of ground support equipment amounts to "considerably more than half" of the total hardware cost of a missile system.

The automobile industry played an active role in the two-day meeting, during both the formal and the informal sessions. The Big Three turned out in force, with representatives of all three companies participating as speakers or as panelists and with Henry Ford II and Harlow H. Curtice presiding at two of the sessions. (L. L. Colbert was not in town.)

GM is seeking the prime contract for the new Minuteman guided missile and Ford is seeking missile work to supplant its jet engine contract, due to run out in January, 1959. Chrysler, of course, is a prime contractor for the Redstone and Jupiter missiles.

Indianapolis Race Correction

The table appearing on page 57 of the June 15 issue of AI incorrectly listed 12 cars as users of D-A Lub. oil in the 1958 Indianapolis Race. Actually only one car—the D-A Lubricant entry—used this oil. The remaining eleven, with which D-A Lub. was wrongly identified, used Mobiloil, making a total of 31 Mobiloil users in the 1958 race.



PROFILE MILLING MACHINE

This electronic tracer-controlled profile milling machine has virtually eliminated hand finishing on B-52 wing spars at Boeing's Wichita plant, thereby reducing production time for wing ribs for a single B-52 part from 200 hours to 8 hours. Giant machine, built by Onsrud Machine Works, Inc., and guided by a General Electric Co. electronic tracer control, provides repeat cuts to accuracies of ± 0.002 in. at production speeds as high as 300 ipm carriage feed and 30 ipm maximum head feed.

Chrysler Planning Additional Plant Moves in Detroit Area

Chrysler Corp. has announced plans for additional plant moves in the Detroit area during the coming changeover period for 1959 models.

Operations at both the Conant and McGraw stamping plants will cease at the end of the current model run and will be shifted to other corporation sites in the area and in Twinsburg, O.

Chrysler earlier had announced plans for moving production of certain engines and the Imperial and De Soto passenger cars during the changeover period. These moves, along with the McGraw stamping transfer, will be completed in time for 1959 production.

The Conant transfer, however, will not be completed until 1960 production begins, according to the corporation, so the move presumably involves tooling for unit construction. Chrysler Corp. cars, with the exception of Imperial, will be built with unit construction in 1960.

Other changes are being made to prepare for the switch in '60. Some of the Mack Ave. stamping operations are being moved into the Plymouth assembly plant on Lynch Rd. in Detroit to ready the Plymouth plant for unit construction.

The moves will give Chrysler more modern facilities for stamping. The Twinsburg plant is in its first year.

AI TABLOID AI

Garret Corp.'s AiResearch Industrial Div. reports it has added a new ratio control system to its turbocharger for Diesel engines, which maintains an optimum flow of compressed air from the turbocharger to the engine under changing engine speed and load requirements.

* * *

Perfect Circle Corp. developed a new seal that is said to eliminate oil loss through valve guides in overhead valve engines. The new device, which consists of a Teflon seal encased in a Buna-N synthetic rubber jacket with a retainer ring, forms a positive seal between the valve stem and guide.

* * *

New Departure Div. of General Motors has developed a new coating film that may allow jet engine ball bearings to operate for several hours after a lubrication system failure with no major damage to bearing parts. Test results with the new film show, according to New Departure researchers, that 30 mm bore bearings were operated at 7000 inner ring rpm, 75 lb thrust, 25 lb radial, 500 F, for ten hours with no added lubricant. Bearing life under the same conditions without the coating ranged from ten minutes to two hours.

* * *

Delco-Remy Div. of General Motors announced the formation of an Applied Science Dept. and an Electro-Chemical Research Dept. to "broaden its research and forward engineering outlook."

* * *

Jones & Laughlin Steel Corp. is merging its Stainless Steel and Strip Steel Divs. into a single production and marketing unit to be known as J&L Stainless and Strip Div.

* * *

Recommendation R48 of the International Organization for Standardization, which sets an international standard for the determination of hardness of vulcanized and synthetic rubber, has been approved as a draft recommendation by representatives of 26 nations, including the U. S. Copies of the recommendation can be obtained at 80 cents each from American Standards Association, 70 East 45 St., New York 17, N. Y.

B. F. Goodrich will expand its new General Chemicals Plant at Henry, Ill., to provide facilities for the manufacture of an antiozonant chemical for use by the rubber and petroleum industries. Antiozonants are added in small amounts to rubber to protect it against cracking under attack from ozone in the air. Construction of the new addition will begin in September with completion slated for Spring 1959.

* * *

The July issue of "Mechanical Engineering," journal of the ASTE, contains a concise vocabulary of Russian technical terms and useful expression together with an explanation of the Russian alphabet. Purpose is to enable engineers to recognize enough words and phrases so that they can determine whether a Soviet technical article is worth translating.

* * *

Quaker Rubber Div. of H. K. Porter Co. reports it has developed an aircraft ground refueling hose capable of conveying all types of aviation fuels. The Buna N is used as the basic polymer and the material, after careful compounding to prevent swelling or loss of adhesion to the carcass, is extruded to produce a continuous, seamless tube.

* * *

The Silicone Products Dept. of General Electric Co. has added a tough 60-durometer silicone rubber compound, designated SE-565, to its standard product line. Because of its unusual physical strength, good compression set, and low moisture absorption, SE-565 is said to be suited especially for seals and gaskets in aircraft and missile applications in the minus 150 to plus 500 F range.

* * *

National Lead Co.'s Nuclear Metals Div. will manufacture nuclear reactor fuel elements for power, research, and propulsion applications in a section of the company's Albany, N. Y., plant.

* * *

Harrington & King Perforating Co., Inc., celebrated its 75th anniversary recently. Since 1883, H & K has specialized in the design, development, and production of perforated sheet metals and other sheet material.

AVIATION MANUFACTURING

Allison Gets Army Contract For New Engine Development

Allison Div. of General Motors has received a \$3.2 million order from the Army for development of a new light-weight turbine engine to power light planes and helicopters. Allison has completed mock-ups and testing of certain components, and expects to go into prototype within a short time.

The 250-hp turbine weighs approximately one-fourth as much as piston engines of comparable horsepower, according to the division.

The new engine comes in two models, one a prop-jet weighing 106 lb and less than 39 in. long, the other a turbo-shaft weighing 90 lb and measuring less than 35 in.

Possible Army applications of the prop-jet include flying jeeps, unmanned reconnaissance planes, ground gun spotting, utility helicopters and others. The turbo-shaft model, equipped with a power takeoff, is pegged for use on rotary wing aircraft, marine installations, gun turrets and other applications.

Allison says the engine has commercial possibilities with performance speeds of more than 300 mph at 15,000 ft.

Allison recently received a \$24 million Air Force contract for production of the T-56 engines for the Lockheed C-130B.

Atran Immune to Jamming In Missile Flight Tests

Air Force's TM-76 Mace, a surface-to-surface missile designed and built by Martin Co., is being test flown at Holloman AF Base to check out its inertial and Atran guidance systems.

Both systems are self-contained and, therefore, are practically immune to enemy jamming, according to Martin. In one of the tests, Martin reported, six ground jammers were unable to confuse the Atran system at altitudes under 1000 ft.

The Atran guidance, which was developed by Goodyear Aircraft Corp., is called a map matching system, because it compares the terrain over which the missile is flying with film strips made prior to flight. If there is any deviation from the programmed route, the missile's path is adjusted to

rematch the terrain with the flight.

The inertial guidance, which was developed by AC Spark Plug Div. of General Motors, is interchangeable with Atran after some minor production changes to the missile. A form of "memory navigation," this system is completely invulnerable to enemy jamming, according to Martin.

In this type of guidance, the geographic position of both launch point and target point must be set into the system. Once on its way to the target, the system "knows" at any given instant how far it has traveled, and it constantly compares its position with the total "remembered" distance. When the distance to the target becomes zero, the Mace explodes in an air burst or impact.

United Aircraft Corp. Forms Two New Space, Missile Units

United Aircraft Corp. announced formation of two new divisions as part of a program to increase its work in the fields of missiles and space flight.

One new unit will be called the Missiles and Space Systems Div., the second unit will be called the Norden Div. Wright A. Parkins, engineering vice-president of United, will head the missiles division, while retaining his present post; and Earle A. Martin, vice-president and general manager of Hamilton Standard Div., will take on the additional job of head of the Norden Div.

H. M. Horner, United chairman, said the missiles group would probably not do any manufacturing. Production work would be done by other divisions or subcontractors, he stated.

The Norden division will be formed as an operating division from Norden-Ketay Corp., which United acquired on July 1. The company, which has about 1800 employees, manufactures electronic and mechanical equipment and instruments for planes and missiles.

Ford Seeking Missiles Work To Boost Defense Business

Ford Motor Co. reportedly is looking for a Government missiles contract for the company's Aircraft Engine Division plant at Chicago, scheduled to complete current orders in early 1959.

According to recent reports in Detroit, the company is interested in getting a prime contract for the AED plant, which is handling the bulk of Ford's \$258 million military contracts. When the last J-57 jet engine is delivered in early 1959, Ford will find itself with an idle plant and a vastly reduced defense program, unless new work can be lined up for Chicago.

In 1957, Ford defense business totaled \$500,000 for additional prototypes of a $\frac{3}{4}$ -ton utility vehicle for the military. Ford contracts for engineering the six-wheel-drive vehicle now amount to \$1.8 million.

MARTIN MACE

The Air Force TM-76 Martin Mace is being test flown at Holloman Air Force Missile Base Development Center, New Mex., to check out its ATRAN or Inertial guidance systems. Both systems are interchangeable, completely self-contained, and require no ground control.





EAST AND WEST MEET AT VANCOUVER AIR SHOW

Seen together for the first time—at the British Columbia Centennial Aviation Show at Vancouver International Airport—are the Boeing 707 and Russia's Tupolev TU-104. The 707 is powered by

four Pratt & Whitney JT3 engines, weighs 247,000 lb fully loaded, carries 110 to 150 passengers, and cruises at 600 mph. TU-104 has two jet engines, carries 50 passengers, and cruises at 495 mph.

Boeing Begins Testing New Helicopter Turbine

Boeing Airplane Co. announced that its new 400-hp single-stage compressor gas turbine—the T60—made its first run in a test cell at the Industrial Products Div. recently.

The engine, which weighs 320 lb, is being developed by Boeing for the Navy for possible use as a helicopter power plant.

The T60, according to Boeing officials, operates at the highest pressure ratio ever achieved in a single-stage compressor engine. The compressor section of the engine is driven by a single-stage radial inflow turbine wheel.

Designed as a simple, low-cost engine, the T60 employs variable inlet geometry in its compressor section to guide the flow of incoming air. This gives efficient operation, the company said, over the full operating pressure ratio range from idle to maximum output at takeoff.

The T60 is an outgrowth of the Boeing 502 series of gas turbine engines.

Conn. Sales Meeting Stresses Long-Range Missiles Program

To get missile business long-range rather than just as a depression filler, a company must be prepared to spend time on market analysis, retain its sales engineers, and get men on the road to learn this new industry.

This was the advice of procurement and sales chiefs from major missile-making concerns at the Connecticut

Missile Sales Conference, attended by 250 company representatives, largely from New England. The forum was sponsored by the Hartford Chamber of Commerce in cooperation with the Association of Missile and Rocket Industries.

AMRI is concentrating on market research and information for its member companies, according to Kendall K. Hoyt, executive director, without duplicating the work of any other association or of the trade press.

Erik Bergaust, editor of *Missiles & Rockets*, predicted the Navy would dominate the missile field, because of the new role of missile submarines.

Panelists included experts from American Machine & Foundry, Consolidated Diesel Electric Corp., Bell Aircraft, Raytheon, Link Aviation, Western Electric, and General Electric.

Goodyear Receives Contract For B-58 Anti-Skid System

Goodyear Tire & Rubber Co. has received a contract to manufacture an automatic anti-skid system for the Convair B-58 supersonic bomber.

Goodyear designed the new system according to specifications outlined by Convair Div. of General Dynamics Corp., the prime contractor.

The system, according to C. A. Hulsemann, manager of the Landing Gear Dept. of Goodyear's Aviation Products Div., automatically prevents blowouts or other damage to tires caused by excessive braking by controlling brake pressure. Sensory devices located in wheel axles detect un-

usual wheel deceleration, he said, and promptly transmit electrical impulses to release braking pressure on the wheel involved.

Space Research Patent Grants To Government Are Protested

Industry is belatedly but bitterly protesting provisions of pending measures creating a new space agency which would give the Government title to all patents developed by industry contractors.

Businessmen complain that the provisions would hamper research and keep many firms from entering the space field.

Opponents say they'll try to amend the bill when it reaches the Senate floor shortly and, if that fails, to get it stricken when Senate and House conferees meet to reconcile the two measures.

The patent provision was not a part of the original administration request for legislation creating the new space research agency. It was added by Congressional committees "as a safeguard because so little is known of what developments will come from space research," a spokesman says.

Existing military contract laws give the Government royalty-free rights to developments of their contractor, but permit the latter to retain title to patents in most cases.

Industry points out that granting the Government a monopoly on developments resulting from missile and rocket research would hamper development of improved civilian products.

MIEN

IN THE NEWS



Borg-Warner Corp.
—Donn Sutton was appointed director of public relations and advertising.

Climax Molybdenum Co.—Kenneth B. Wood, Jr., was made assistant manager of lubricant development.

Clevite Corp.—A. L. W. Williams has been elected a vice-president.

Chrysler Corp.—Donald W. Matzen was appointed purchasing agent for the Service Parts & Accessories Supply Div.

Westinghouse Electric Corp., Lamp Div.—Robert M. Harris was made marketing manager of the photo-miniature lamp department.

Jones & Laughlin Steel Corp.—Clem W. Gottschalk, vice-president-traffic and transportation, has retired.

Douglas Aircraft Co., Inc.—F. T. Wood, Jr., has been appointed quality manager of the Santa Monica Div.

Westinghouse Electric Corp., Welding Div.—Roger R. Giler was named product planning specialist.

General Electric Co., Jet Engine Dept.—M. R. Rowe has been appointed manager of the Controls and Accessories Section.

Borg-Warner Corp.—Fred T. Miller was appointed regional sales manager for Weston Hydraulics, Ltd., a B-W subsidiary.

Eaton Mfg. Co., Axle Div.—Cecil C. Wickson was promoted to assistant factory manager; Paul R. Shirar, general superintendent; and Robert A. Wieland, chief industrial engineer.



Reynolds Metal Co.
—Heinz V. Menking has been named general director of product development.



Olin Mathieson Chemical Corp.—Jess E. Williams was named vice-president—metals, and Edward Block was made vice-president—chemicals.

Bendix Aviation Corp., Cincinnati Div.—Henry B. Yarbrough has been appointed general sales manager, and L. E. Rasmussen was named general manager.

General Electric Co., Production Engine Dept.—A. S. Johnson was named manager of facilities.

National Lead Co., Nuclear Metals Div.—A. Stewart, Jr., has been appointed manager, industrial department.

Carpenter Steel Co., Alloy Tube Div.—Nicholas Chernik was promoted to assistant chief metallurgist.

General Tire & Rubber Co., Plastics Div.—Robert H. Hurley has been made manager of central styling and design.

Vertol Aircraft Co. (Canada) Ltd.—Max Bowen has been elected vice-president.

Allied Products Corp.—Robert A. Niemi was named executive vice-president and general manager.

Willys Motors, Inc.—James H. Drum has been named manager of the government sales office in Washington, D. C.

National Malleable & Steel Castings Co.—Wilson P. Burns has been named manager of the Cleveland Works.



Armstrong Cork Co., Industrial Div.—E. W. Jones has been appointed manager of the newly created Product Planning Dept.



National Acme Co.
—J. L. Molner was promoted to chief engineer.

Borg-Warner Corp., Pesco Products Div.—Edward G. Howard was named Washington, D. C., representative.

Elwell-Parker Electric Co.—George A. Markell has been appointed sales manager.

Russell, Burdsall & Ward Bolt & Nut Co.—William Herman Schmidt was named plant superintendent at Port Chester, N. Y., and Olof V. Johnson, succeeds him as superintendent of the Los Angeles, Calif., plant.

Crucible Steel Co. of America—Donald S. Foote was named works manager of the Titanium Div. at Midland, Pa., and Howard T. Clark, Jr., was made manager of the Midland (Pa.) Research Laboratory.

Burroughs Corp.—U. C. S. Dilks was appointed associate director-commercial products; Edward Lohse, associate director-defense products; and J. H. Howard, manager, research and development division.

Firestone Tire & Rubber Co.—C. E. Baker has been named manager of the Sacramento, Calif., district.

Clark Bros. Co.—Robert J. Spears and Richard E. Jenkins were appointed assistant general sales managers.

Westinghouse Electric International Co.—A. B. McCloskey has been made vice-president-marketing, and R. L. Jeans was appointed vice-president-products.

Borg-Warner Corp., Ingersoll Kalamazoo Div.—Dale R. Angle has been named factory sales representative.

Symington Wayne Corp., Wayne Pump Co. Div.—Warren Dubsky has become head of the Engineering Dept., and Edward L. Copony is now head of the Research and Development Dept.

(Turn to page 43, please)

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MIEN

IN THE NEWS



United States Rubber Co.—Walter D. Baldwin was named vice-president in charge of the newly formed automotive sales department.



Cincinnati Milling Machine Co.—E. D. Vancil was elected vice-president, and L. E. Eberts was elected vice-president of Cincinnati Milling & Grinding Machines, Inc., the firm's sales subsidiary.



Burroughs Corp., Burroughs Div.—DuRay E. Stromback has been named general manager of Plymouth Manufacturing and Engineering.

Continued from Page 40

Raytheon Mfg. Co.—**Peter J. Schenk** has been appointed assistant to the president for government marketing.

Huck Mfg. Co.—**James E. Jewett** was named engineering representative for the northern half of Los Angeles and southeastern Nevada, and **John E. Kenealy** was made engineering representative covering the automotive industry in the Detroit area.

Bendix Aviation Corp., Friez Instrument Div.—**LeRoy D. Kiley** is retiring after 17 years of service, and **Vernon D. Hauck** succeeds him as general manager.

Norton Co.—**C. John Sundberg**, assistant to the vice-president and director of sales, has retired.

Pacific Semiconductors, Inc.—**Robert T. Diehl** has become general sales manager.

Taylor Fibre Co.—**Peter L. Shanta** has been appointed technical director.

Chrysler Corp.—**Dr. Phillip W. Lett** has been named chief engineer and **Walter C. Beyer** assistant chief engineer of Defense Engineering.

Consolidated Electrodynamics Corp., Transducer Div.—**Robert E. Stanaway** was named manager of the Spectron Dept.

L. O. F. Glass Fibers Co.—**Richard A. Pim** has been named chief engineer of the eastern division.

General Dynamics Corp., Convair Div.—**Karel J. Bossart** and **Dr. John C. Clark** have been appointed to the staff of R. C. Sebold, vice-president-engineering.

Hydrosyne Corp.—**D. V. Rowton** was made vice-president-sales.

Metal Carbides Corp.—**Karl P. Hockenbery** was named district sales manager for the Michigan area.

Narda Ultrasonics Corp.—**Bernard Schmidt** has been named manager of the newly formed Chemical Process Div.

Chemetron Corp., Tube Turns Div.—**Jack D. Tolliver** has been promoted to newly established position of sales manager for the Eastern region.

Standard Oil Co. (Indiana)—**John B. Duckworth** has become research coordinator in the research department at Chicago.

Goodyear Tire & Rubber Co., Aviation Products Div.—**E. M. Humphrey** was appointed manager of field sales and service, and **J. R. Reynolds** manager of fuel tank sales.

Allen B. Du Mont Laboratories, Inc. **Harry G. Boyle** has become assistant division manager for industrial sales in the Industrial and Military Equipment Div.

Reliance Electric & Engineering Co.—**E. L. Bronold** has become sales manager of apparatus sales, with headquarters in Cleveland, and **C. Porter Packard** is now sales policy manager in the department of marketing services, also with headquarters in Cleveland.

Campbell Chain Co. — **Albert A. Hally** has become vice-president for marketing.

Carpenter Steel Co.—**W. Kent Kise, Jr.**, was appointed metallurgist in the special alloys development group.

Marquette Mfg. Co., Inc.—**Ralph R. Staal** has been appointed sales manager.

Republic Aviation Corp.—**William P. Burch** has been appointed director of military sales for the Helicopter Div. and **Brig. Gen. John M. Sterling, USAF** (retired), was named director of operations in Europe.

AC Spark Plug Div., General Motors Corp.—**Harry W. Lisiak** has been appointed director of works standards, succeeding the late **Joseph H. Carah.**

Allis-Chalmers Mfg. Co.—**James F. Foley** has been appointed assistant advertising manager, Farm Equipment Div., and **M. J. Rotroff** was made manager, general sales, New York City, for the Tractor Group.

Necrology

Paul H. Van Osdol, 50, assistant service manager of Construction Machinery Div., Allis-Chalmers Mfg. Co., died June 21.

Carlyle C. Dunsmore, 68, former assistant manager of Allis-Chalmers Mfg. Co. farm equipment sales department, died June 18, at Milwaukee, Wis.

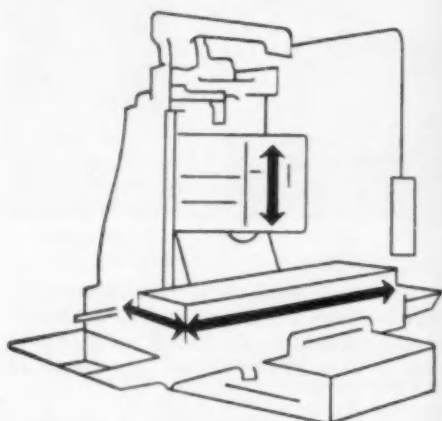
Donald R. Larkin, 57, retired manager of the Fisher Body Pontiac (Mich.) plant, died June 15, at Royal Oak, Mich.

John R. Winter, 81, automotive pioneer and head of the J. R. Winter Pressed Steel Co., died June 13.

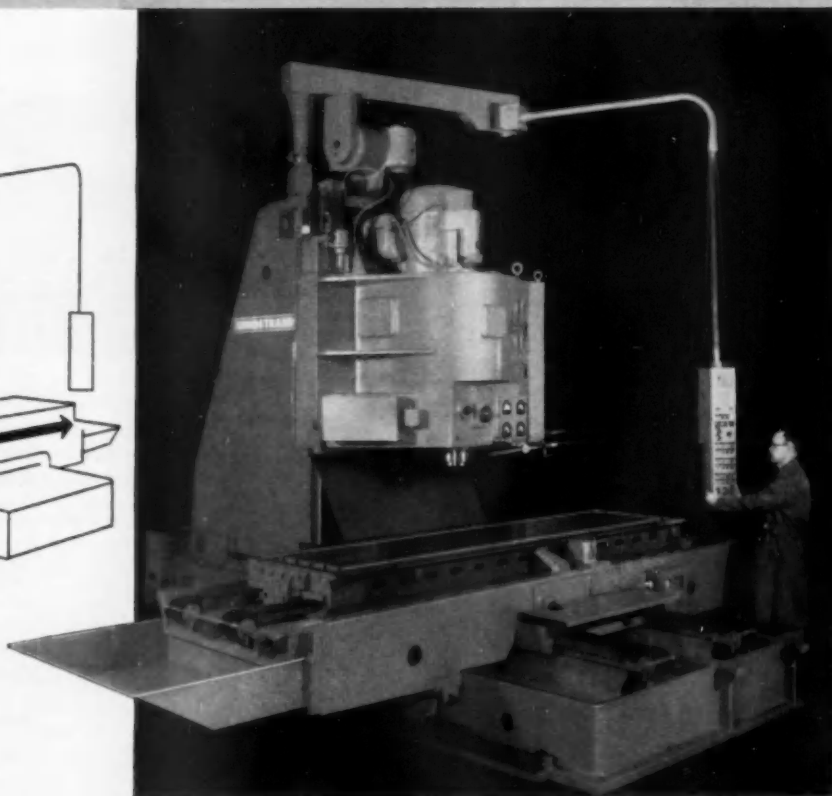
Vincent J. Dolan, retired purchasing agent for Bell Aircraft Co., died June 13.

Howard A. Kenworthy, 73, a retired executive of Tube Reducing Corp., died June 9.

New Sundstrand 50 hp Vertical Rigidmil Provides Three Directional Feed



Transverse, longitudinal, and vertical feed makes the new Sundstrand 50 hp vertical Rigidmil an efficient producer on large work.



● Sundstrand's new vertical Rigidmil combines the ruggedness needed to handle large workpieces with workhandling flexibility by providing powered transverse, longitudinal, and vertical feed — controlled conveniently from a single pendant station. The 50 hp milling head has a speed range of 15 to 1500 rpm with speeds selected from the control pendant. Head transmits 1 hp per rpm up to maximum rated hp.

Outstanding accuracy is assured by the fixed column and fixed base design. The fixed column holds head rigidly for 50 hp cuts, while the fixed base eliminates overhang deflection and insures maximum support for the cutter for all positions of saddle and table. Maximum height between spindle nose and top of

table is 30 inches. Up to 44 inches transverse stroke of saddle and 96 inches table feed stroke enable large workpieces to be machined with maximum efficiency.

Vertical feed rate of head is infinitely variable from 3/16 to 50 inches per minute with rapid travel being 50 ipm in either direction. Transverse feed of saddle is infinitely variable between 3/8 and 75 ipm; rapid travel is 75 ipm in either direction. Longitudinal feed is infinitely variable between 3/8 and 150 ipm with rapid travel in either direction being 150 ipm. All movements are pushbutton controlled at pendant.

Write Sundstrand for more details on the 50 hp vertical Rigidmil.

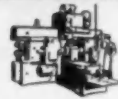
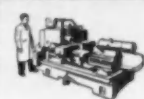
SUNDSTRAND MACHINE TOOL CO.

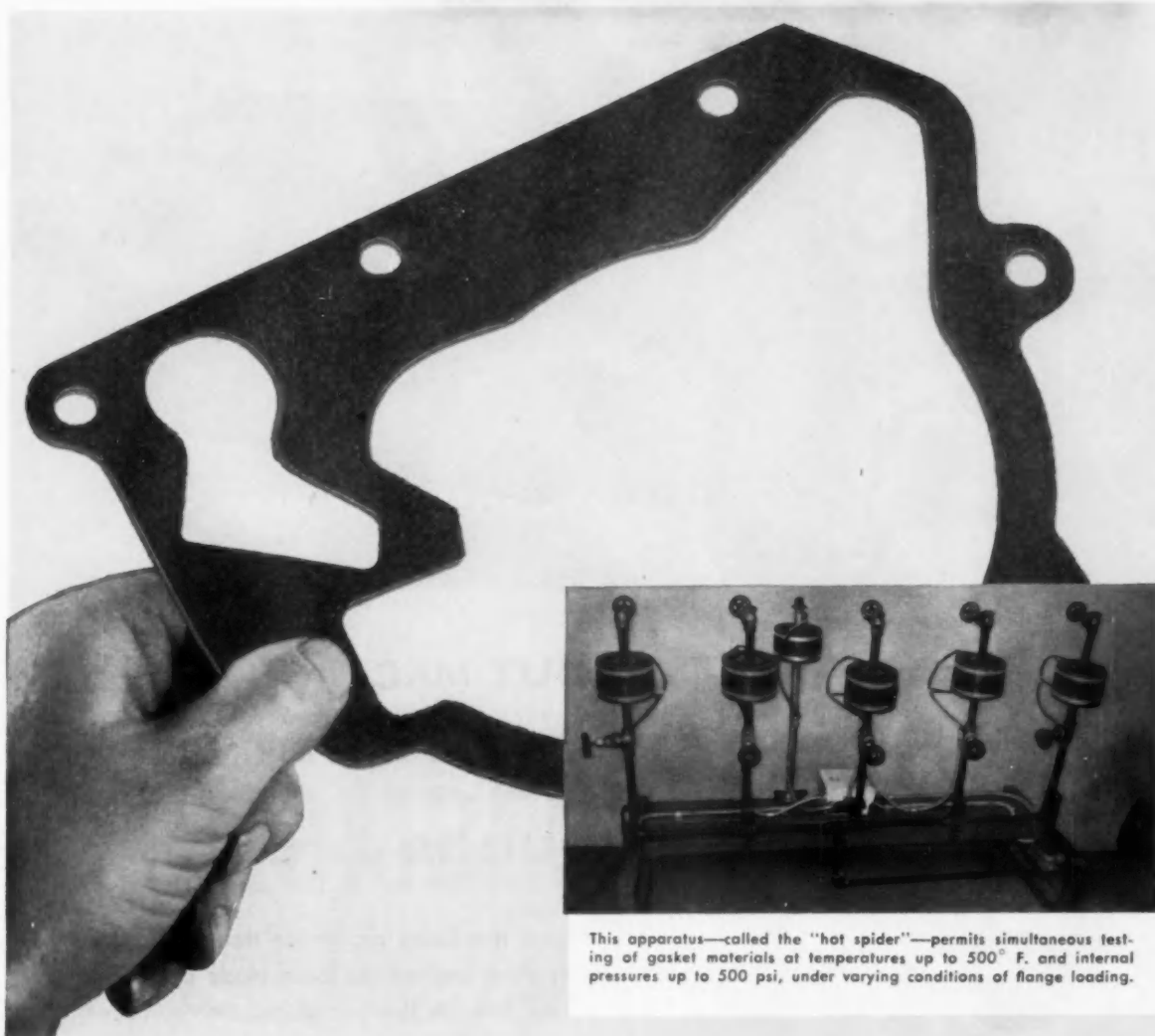
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This apparatus—called the "hot spider"—permits simultaneous testing of gasket materials at temperatures up to 500° F. and internal pressures up to 500 psi, under varying conditions of flange loading.

Accopac gaskets maintain bolt torque, seal automatic transmissions perfectly

In today's automatic transmissions, the combined effects of elevated temperature and high internal pressure often cause leakage at gasketed joints.

To meet these difficult sealing requirements, new Armstrong Accopac gasket materials have been developed. They seal transmissions perfectly under combinations of heat and pressure that can cause extrusion and excessive bolt-torque loss with conventional materials.

The new Accopac materials are pre-compressed, high-density sheets made by a beater-saturation process pioneered and patented by Armstrong. Sheets made in this way are tough, flexible, and crush resistant.

These Accopac compounds are recommended for a wide range of heavy-duty applications. Where temperatures above 300° F. are involved, Accopac asbestos-

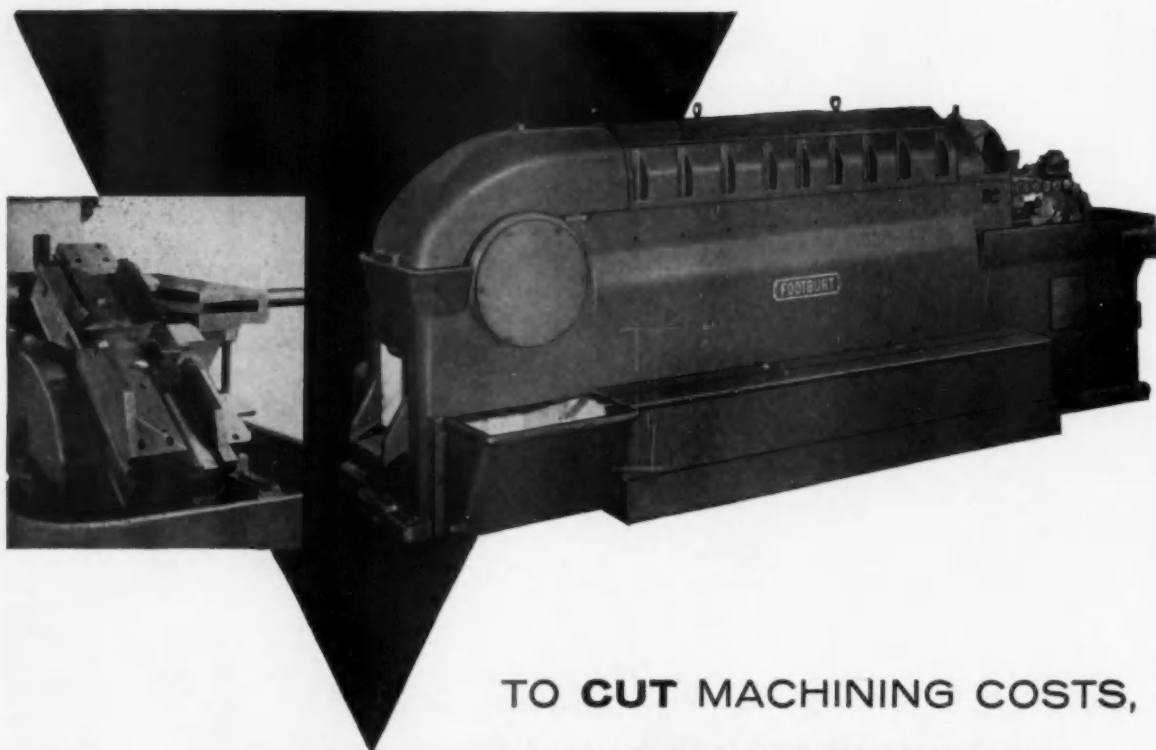
fiber sheets are recommended. For temperatures up to 300° F., new cellulose-fiber stocks are available.

The new compositions can be used as economical replacements for conventional sheet asbestos or other more expensive materials. In many cases, the Accopac materials make possible substantial savings.

Armstrong Accopac is available in rolls, sheets, ribbons, and die-cut parts. For more information about these versatile new compositions, write for a copy of our new Accopac folder. Address Armstrong Cork Co., Industrial Division, 7007 Imperial Ave., Lancaster, Pa.

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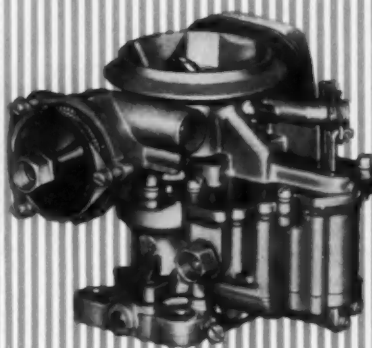
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Bendix-Elmira, N. Y.
ECLIPSE MACHINE DIVISION



Hardening Automotive Parts in Furnaces with **VERTICAL RADIANT TUBES**

By Kenneth Rose



Conveyors carry parts to the charging ends of four parallel furnaces at Chevrolet's Flint plant

Charging end of the carburizing furnace in Ford's British plant



FURNACES for carburizing, carbonitriding, and straight hardening that make use of vertical wrought alloy radiant tubes have been put into services in several automotive plants. Use of the vertical tubes cuts down on the amount of floor space that is required for operation and maintenance of the furnaces, while pusher type loading makes the furnace cycle automatic. Wrought alloy tubes are usually of thinner wall thickness, permitting more rapid heat transfer, and are generally longer lived than cast tubes.

An installation at Chevrolet's engine plant at Flint, Mich., is used for carbonitriding rocker arms and hemispherical ball joints for the engine. This is a single row continuous furnace, using an endothermically cracked natural gas enriched with a small amount of natural gas and ammonia. It is natural gas fired.

The valve rocker arms are formed from rolls of strip steel, Type C 1010, rimmed in automatically fed blanking and progressive dies. After being formed in the presses, the rocker arms are carried on a belt conveyor to a screw washer, and after washing, to other presses for restrike and coining. The stud and ident holes are next pierced on piercing presses, the pieces are collected in small wheeled gons, 12,000 pieces to the gon, taken to a screw washer for a final cleaning, then taken to the

loading end of the furnace.

The furnace chamber, 16 ft long, takes 4 trays. Parts are fed into baskets automatically by a Magnavator loader, and the baskets are loaded onto alloy trays, 3 baskets to the tray. Baskets are of Nichrome wire. Four trays, each 24 in. wide and 4 ft long, fill the furnace. Each basket holds about 700 pieces.

The furnace is of the pusher type, with hydraulically operated pusher and pneumatically operated doors. Temperature for carbonitriding is about 1500 F. A slight differential is maintained in the furnace zones. The furnace operates at 55 to 60 min per push for this work, and with four trays in the furnace there are four pushes per cycle. The case produced in the steel is required to be 0.010 to 0.030 in. deep; actual case found on production parts is 0.015 to 0.020 in. deep. At the end of the furnace cycle the parts are quenched in oil, washed to remove the oil, and then are phosphated. A final dimensional inspection is made with automatic air gages.

A larger furnace of the same type is now operating at the Ford plant in Dagenham, England, where it is being used for the carburizing of gears. This is a three-track furnace, with a chamber 35 ft long, common to all three rows, heated by 100 vertical radiant tubes. The fuel used is coke-oven gas. The operating temperature is 1700 F. and this temperature is held to within plus or minus 5 F.

Like the furnace at the Chevrolet engine plant, this furnace is pusher actuated. Loaded trays of gears at the charging end are pushed into a gas lock, then into the main chamber by hydraulically driven rams. There are 28 trays on each track, or 84 trays in the fully charged furnace at a time. The trays are carried to the quench by an electrical mechanism at the discharge end of the furnace. Output of the furnace is said to be 830 lb per hr at heavy case depth. Interlocking controls at the charge and discharge ends of the furnace prevent premature loading of a tray, or the opening of the doors at both ends of the furnace at the same time.

At the West Allis Tractor Works of Allis-Chalmers Mfg. Co., a two-



▲
The 54-ft British installation has a 35-ft furnace chamber



►
Allis-Chalmers uses furnace for carburizing a variety of tractor gears

row hydraulic pusher furnace of the same type is used for continuous gas carburizing of miscellaneous tractor gears and shafts. Each row holds 16 trays. The work is manually positioned and loaded onto the trays, then pushed into and through the furnace by the pusher mechanism. Two cycles are used to get case depths in two different ranges, 0.025 to 0.040 in. and 0.040 to 0.055 in. Cycles are 9 and 12 hr.

The gears are stacked on alloy wire mesh baskets. Larger diameter gears are pressure quenched, and these are stacked on alloy spacers to facilitate handling. Quenching and quench transfer of the smaller sizes in the atmosphere quench chamber is automatic.

Several furnaces of the same type are now being given test runs in other automotive plants on a variety of work, with different production capacities.

Two-Panel Hoods Produced on Mechanical Lines

By
Warren Zerby

SENIOR ENGINEER

Pontiac Motor Division
GENERAL MOTORS

... OPERATIONS ON BLANKS ...

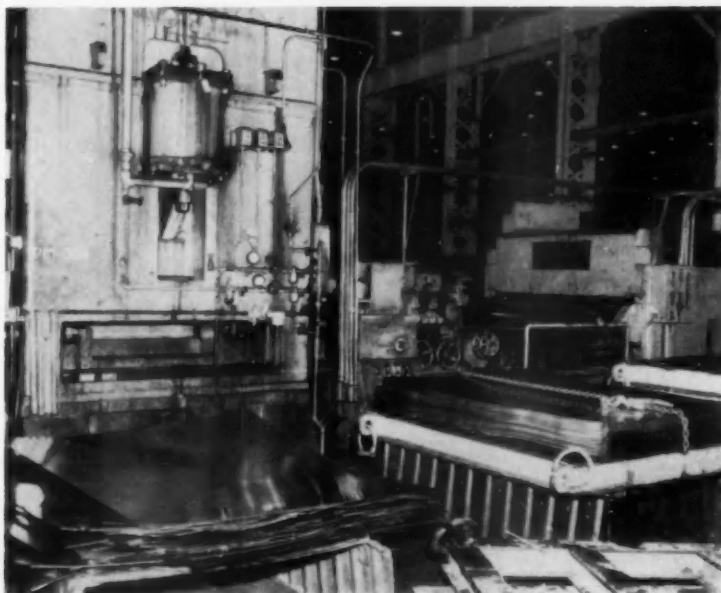


Fig. 1—McKay equipment is employed to uncoil stock 72 in. wide, oil and level it and feed it to the Verson blanking press shown here. Blanks for inner and outer hood panels are the same and are stacked on pallets for transfer by crane to processing lines

Fig. 2—Leader for blanks that are fed into the dies that draw, emboss and form the inner panels for Pontiac hoods. One blank is shown in the die and one, already formed, has been transferred by a shuttle out of the die on its way to a turnover.



PONTIAC Motor Division, Pontiac, Mich., has added several large presses as well as much other new auxiliary equipment to produce outer and inner hood panels for 1958 and subsequent models. Included in the new setup is mechanical handling between presses and other operations which virtually eliminates manual handling of the panels. This new handling system is built to designs of Pontiac engineers and does not employ commercial loaders, extractors and transfer units of types often used for similar handling of large stampings in many other plants.

All Pontiac hoods involved outer and inner panels both of which are made from 20 gage (0.0359-in.) deep drawing stock purchased in 30,000 lb coils 72 inches wide. Blanks for both panels are identical in size and measure 72 inches long but are narrower at one end than the other. Shearing at an angle produces two blanks per hit with no scrap.

After mounting on an uncoiler, the coiled stock is fed automatically to McKay rolls, some of which appear at right in Fig. 1. During passage through these rolls, cleaning, oiling and leveling take place. There is a pit for a coil loop in front of the rolls that feed the 400 ton Verson blanking press also shown in Fig. 1. Electric eyes in the pit are so arranged that feed to the press stops if the loop becomes too short and uncoiling stops if the loop becomes too long.

Stock feeds through the ends of the press, and blanks are manually withdrawn and rotated 90 deg to be fed through a McKay flex roll and stacked automatically. Regular stacks with the short ends all one

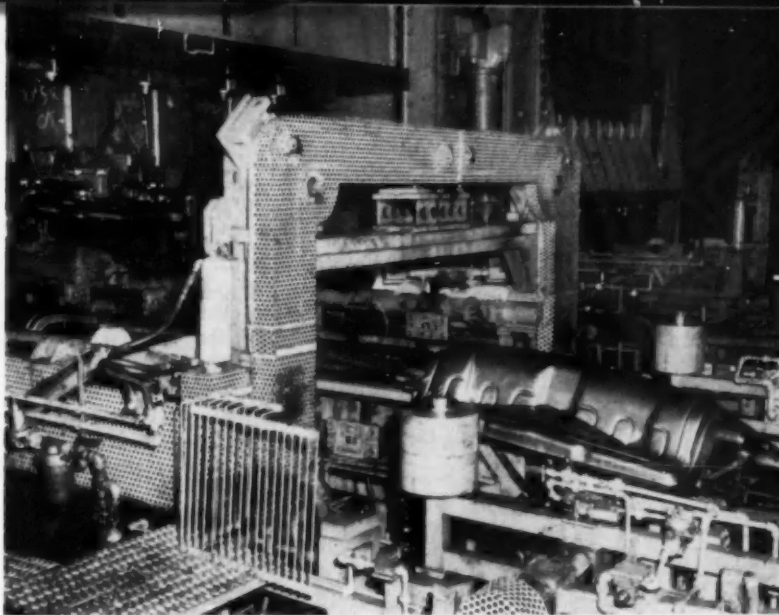


Fig. 3—An inner panel after advance from the draw die and turnover rests on tubular rails along which it is to be shuffled into the trim die of the second press in the mechanized line.



Fig. 4—Inner panels as they appear in and after advance from the die that flanges the sides and ends. Rocking arms on shuttles at right and left lift the stamping from the die. After shuffling occurs, the arms unload the stamping onto rails for advance to finish piercing.

way are built up on pallets for crane shifting to the two parallel press lines for outer and inner panels.

Although the coil stock all is purchased to the specifications, the coils vary in drawing quality and in surface defects, partly because the coils come from different heats. As the inner panels are not exposed in service, minor defects in the stock are not of importance, whereas the reverse is true of the outer panels. Hence the best coils are selected for the latter on the basis of visual in-

spection and draw tests. If drawing qualities prove inferior or if surface defects show unduly, the coils involved are used for inner blanks.

Two lines of five presses each are used for outer and inner panels but are run in approximate synchro-

. . OPERATIONS ON INNER PANELS . .

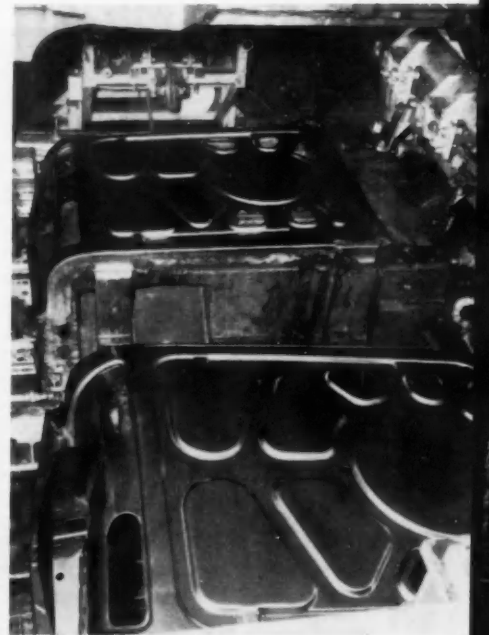


Fig. 5—Panel as it appears in the fourth die, which has cam operated components that do piercing and reflanging.



Fig. 6—Operator using a hand tool to insert and partly fasten a bracket that is spot welded after the panel is advanced by a chain into the welder at left.

. . OPERATIONS ON OUTER PANELS . .



Fig. 7—Major flanging of the outer hood panel is done in this die in a 600-ton Niagara press. Transfer arms then rock up to lift the panel from the die. After shuttling, the arms rock down and deposit the panel on tubular rails, foreground.

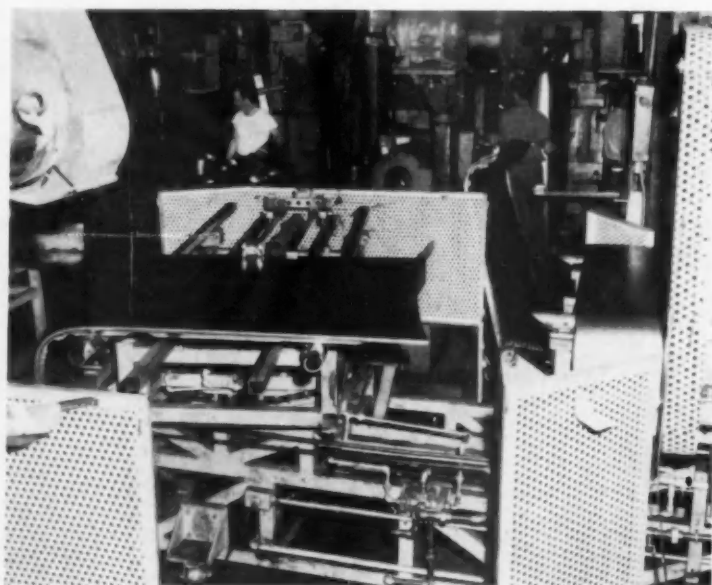


Fig. 8—After final flanging in a cam die, the outer hood panel is advanced into this station where a horizontal turnaround moves the panel 180 deg so that its nose, formerly at one side, faces other side.

nism even though the individual operations differ. This is necessary because, near the end of the

combined lines, the two panels are sandwiched and welded to form hood assemblies.

Running through the large presses on each line there are at each side shafts carrying arms attached to shuttling sleeves. These arms are rocked upward to elevate the stamping after the opening of each die in the line until the stampings clear the lower dies. Then the sleeves are shuttled forward to carry the stampings out of the dies, whereupon the arms rock down again. In so doing, they deposit the stampings on rails for automatic advance to the next station and clear the stampings for such advance. Backward shuttling then occurs to the point where arms are in position to pick up the next stampings.

Similar arms on other shuttles lift stampings from rails and lower them into the next die. All such motions are interlocked by limit switches between press motions and open stations so no interferences can occur. A press cannot be closed until the panel is on the die post and another panel at least is starting into the load station.

Stacks of blanks for both lines are placed on transverse roller conveyors by a crane. From these conveyors, the stacks are shifted as needed onto hydraulically operated lift tables, one of which is in front of the first press in each line. Height of each table is adjusted by the operator to maintain a constant level to feed the sheets into the blank loader as shown in Fig. 2.

Chain operated dogs engage the blank and load it into the die automatically at the correct time in the press cycle. Figure 2 shows a blank for an inner panel in position for drawing and beyond it a panel that has been drawn and shuttled out of the die on its way toward the trim press. This operation is done on a 1000 ton Clearing press which forms the part downward.

Before the drawn panel is trimmed in the second press, a 1000 ton Danly, the panel enters a turn-over (Fig. 3), and is deposited on rails for advance to the second press into which it is shuttled as described above. Figure 3 shows the panel after turnover and ready for advance to the trim press in the background. Cut up offal from the

trim die falls onto belts that feed it into chutes to a basement conveyor for advance to the balers.

In Fig. 4 the flanging die is shown with a trimmed panel about to be lowered onto the die post and a flanged panel ejected. Flange and restrike of the inner panel are performed in another 1000 ton Danly press and the third press of the same make and size that performs reflanging and finish piercing. Figure 5 shows one panel in the die of this press and another, foreground, in the load position. The fifth press performs the final operation, cam flanging the sides complete.

From the last named station, inner panels, ready for assembly, are advanced to a station as shown in Fig. 6. There a hand tool is used to apply a bracket tool for welding. When this has been done, the operator sets the nose of the panel over lugs on inclined chains. They advance the panel into a Delta welder shown at left. Before the welder cycles, men at each side of the welder apply small stampings that are welded to the inner panel to make it ready for assembly to the outer panel.

Operations for the outer panel are somewhat similar to those on the inner panel and automatic handling is done in the same way. Presses are lighter, that for the initial draw being a 600 ton Clearing and the four remaining presses are 600 ton Niagaras.

Figure 7 shows a flanged panel about to be ejected and, in the background, a trimmed panel at the load station. In the fifth and final press in the outer panel line, a cam die performs final flanging and curl under at the sides and wipes the end flange to its final position. After shuttling from this die to rails, the panel is advanced to the turnaround, Fig. 8. There the panel is turned 180 deg while in a horizontal position and then is ready for automatic advance to the sandwich machine, Fig. 9. This makes the assembly of inner and outer panel ready for spot welding in the Martin machine, shown in the background of Fig. 9. Advance of the



Fig. 9—Inner and outer panels (shown standing on floor at left) enter this "Sandwich" machine via conveyors at right angles. When the two panels are nested, they are advanced mechanically into the Martin spot welder, background, to produce the final hood assembly.

"sandwich" into this machine is done automatically by conveyor. When the assembly reaches welding position, the machine closes, applying pressure so that weld areas are in close contact. Welding guns are then "fired" in sequence, after which the machine opens and the complete assembly is lifted out by two men who hang it on a chassis

conveyor on which final inspection is done.

Because of the size and frailty of the panels, before assembly, the use of mechanical handling equipment is a necessity. This also eliminates fatigue and the possibility of damaging the panels when handled manually besides increasing productivity.

• • •

GM of Canada Negotiating New Contract with UAW

General Motors Corp. of Canada has begun negotiations with the United Automobile Workers Union for a new contract to replace the current one which expires August 1.

The Canadian UAW is asking for a wage increase to close the gap between hourly rates prevailing in U. S. plants and those in Canada. The differential amounts to about 38 cents for production workers and 70 cents for skilled trades.

The union also wants the company to incorporate the current 17 cents an hour cost-of-living bonus into the

regular hourly rate, improve pension and unemployment benefits, pay the full cost of medical and hospital care, increase shift premiums, increase total paid statutory holidays from 8 to 10.

Union demands are based in part on the high level of production maintained by GM of Canada in the period from January to May of this year. Production of passenger cars during the period amounted to 84,195 units, up 2478 over the same period last year. Combined car and truck production, however, was down 1811 units in the like period.

Automotive and Aircraft

USES OF TIN

Poundage Figures Used Per Unit Slight, But Total Tonnage Consumed
Runs to Sizable Amount in Plating, Solders, Alloys, and Chemicals

By Andrew W. Shearer

TIN in the form of platings, solders, alloys, and chemical compounds plays an important role in a host of different industries. It is fundamentally a soft metal with both a low melting point and structural strength. For that reason it remains behind the scenes alloyed with metals of higher melting points and greater strength. It also serves well as a coating for stronger but less corrosion-resistant metals, such as steel, copper-base alloys, and aluminum.

As an alloy, tin is useful even when the tin content is as little as one per cent of the whole. However, when alloyed to the extent that it is a substantial constituent, such as tin babbitt, solder and bronze, tin performs many valuable functions in such applications as automobile assembly.

When used as a coating for other metals, one pound of tin will cover thousands of square inches of metal surface. Aside from the protection that thin tin coatings provide for the metal surface, they aid the joining of one metal to another by soldering.

AUTOMOTIVE APPLICATIONS

While the weight of tin in a passenger car, truck, or bus may run on the average from only one to three pounds, the automobile industry as a whole requires a substantial tonnage of the material. It is estimated, for example, that 36,500 net tons of tin plate alone were consumed by the industry in 1957.

Taking a specific example, Ford Motor Co. reports that its representative 1958 vehicle production will use the following amounts of tin per vehicle: Ford passenger car, 1.5 lb; Ford truck, 1.5 lb; Edsel car,

2.2 lb; and Mercury car, 2.5 lb. These amounts include the tin used in solder and plating, as well as the tin contained in alloys.

The real story of tin in the automotive field does not lie, however, in the quantities used, but rather in the number of essential purposes which it serves.

Body Work

The tin that is used in automobile manufacture is not usually visibly associated with the appearance of the finished car. It does, however, have one useful application to body work—the smoothing-over of welded seams that cannot conveniently be covered with trim. Body solder is applied to the welded seams first by coating the seam with a 20 per cent tin—80 per cent lead alloy and then filling the seam with a lower tin solder composed of an alloy containing about three per cent tin.

Buffing the filled joint to a perfect contour is readily accomplished, and painting covers up the seam perfectly. Improvements in welding methods have reduced the use of body solder on new cars; but, in the repairing of small dents and surface imperfections, it is still widely used by repair shops.

Cooling System

It is under the hood of the automobile that tin plays its most important role in such applications as the cooling system. Tin-lead solder is used to seal air and water passages in the series of copper fins and brass tubes found in radiator cores.

The cores are assembled in frames, and then the edges are dipped automatically in a molten bath of 20 per cent tin-80 per cent lead solder. The lower and upper water tanks and hose fittings are also soldered in place. This type of solder is likewise used in the production of radiator-type cores for heaters and air conditioning equipment.



Chevrolet assembly line showing pistons coated with tin. (Photo courtesy of Chevrolet Motor Div., General Motors Corp.)

Electrical System

The ease with which the electrical system of the modern passenger car works so efficiently year in and year out depends a great deal on tin. Plain copper wire, even when covered with rubber or plastic insulation, can deteriorate quickly. To prevent this, copper wire used in the wiring harness is precoated with tin before the insulation is applied. The tin coating protects the copper wire from attack by sulphur in the rubber insulation. It also provides a clean surface which allows the wires to be soldered with mild flux at any time during the life of the car.

Some power accessories require electrical motors. Tin-containing solder performs a vital function in binding the wires at the end of the armature and in joining the wiring to the commutator bars.

The automobile radio could not operate properly if just one of the many connections were not permanently joined with tin-lead solder. The newer types of radios with printed circuitry and transistors use even more tin than conventional radios. Tin-coated copper wire and solder thus assure smooth functioning of the ignition and lighting systems and power equipment.

Engine

Efficient engine operation requires that the connecting rods and crankshaft travel smoothly on a bearing surface with good film lubricating properties. The tin-base babbitt insert bearing, while only 0.002 to 0.005 in. thick, operates well with peak loads up to 3000 psi, and micro-babbitted bearings are still in use.



An inspector checks electrical connections in the cockpit of a Douglas commercial transport. Tin solders are fused to give strong, impermeable, electrically conductive joints. (Photo courtesy of Douglas Aircraft Co.)



TIN USES IN A 1958 PLYMOUTH

Application	Wgt. of Tin (Lb.)
Body solder	0.120
Tin plate	0.030
Bearing alloys	0.100
Radiator solders	0.700
Fuel tank coating	0.002
Heater solder	0.300
Total	1.252 lb.

At left, electroplating piston rings. (Photo courtesy of Muskegon Piston Ring Co.)

Peak loads in the neighborhood of 4000 psi, however, are not uncommon in modern passenger cars. This situation has caused a swing to either a copper-lead alloy bearing with a tin-lead overlay, such as the Durex-100, or an aluminum-base alloy with a tin-lead overlay, such as the Moraine-400 bearing. Tin, therefore, still has an important function as an automotive bearing material, either in the form of babbitt or as an overlay on substitute materials.

An improved bearing alloy has been developed by the Tin Research Institute that is said to be more serviceable than copper-lead for insert bearings. The new bearing metal is an alloy of aluminum and tin with a small amount of copper. The tin content is about 20 per cent, and the tin exists as a network of particles distributed evenly within the continuous matrix of aluminum. The aluminum-tin alloy is readily bonded to a steel backing.

Under severe loads, the film of tin between the bearing surface and the shaft is renewed indefinitely from the body of the bearing metal, and friction is reduced. A bearing overlay is not needed to reduce shaft wear, and production costs are reportedly less than those of copper-lead bearings. This improved bearing is now fitted to the Italian Fiat 500, 600 and 1100 car series. U. S. automobile manufacturers have indicated considerable interest in the development.

The film lubricating properties of tin are utilized in another way for engine parts. It has been standard practice for years in the automobile industry to apply an electroplated coating to piston rings and pistons. Both cast iron and aluminum base metals are electroplated. The tin coating on the rings and pistons is particularly beneficial during the breaking-in

of the engine and until the parts are properly seated. It continues to aid in lubrication during the life of the car.

Copper-base alloys containing tin (phosphor bronzes) have a number of miscellaneous uses in the manufacture of such parts as contact springs, bushings, retainers, gears, and thermostat bellows.

Fuel System

Tin also enters into a number of applications involving the fuel system. Some fuels may have a corrosive effect on carburetor parts, and an electro-deposited coating of tin-zinc has aided in solving this problem.

Fuel lines are kept clean with a newly developed porous bronze filtering material built into the fuel tank. Tin and copper granules are formed into the shape of tubes, bowls, and flat circles and then heated in an oven to fuse the particles together for fuel filter parts. A porous, but non-clogging, medium is thus provided.

Some cars are equipped with a filtering device in the gas tank through which gasoline is drawn into the fuel line. This unit is equipped with a porous element which is also electroplated on the surface. The porous bronze filter will not allow extraneous dirt or moisture to pass into the fuel line. The fuel tank itself is also protected against corrosion with a tin-lead coating containing approximately 12 per cent tin.

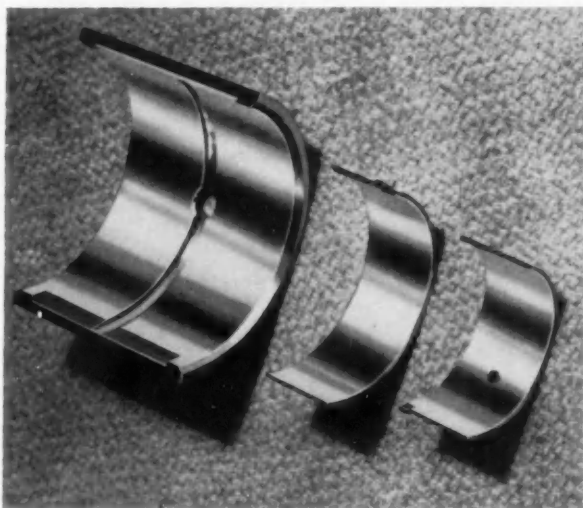
Other Applications

Tin-coated steel sheets as heavy as 22 gage are available from the mills, and the automobile industry

now uses this material widely for air cleaners, oil filters, covers, vents, and hot air ducts. The outstanding advantage of tinned steel sheet is that it has the strength of steel plus good formability. The tin coating serves as an excellent base for painting without the use of a primer coat.

Less extensive uses of tin are found in speedometer parts. Speedometer pinion gears are made from die casting alloys high in tin content which operate without lubrication.

Vinyl plastic sheet, if it is to be a useful mate-



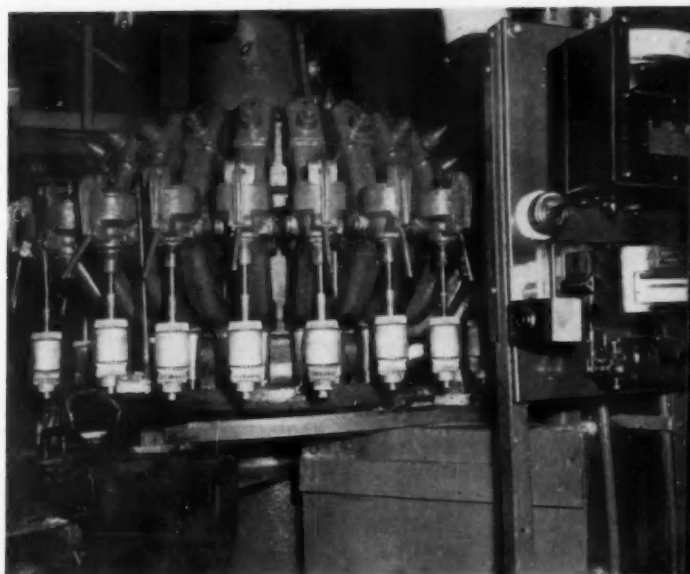
Steel-back, tin-base babbitt bearings. (Photo courtesy of Federal-Mogul Corp.)

rial for windows, must be heat and light resistant. Organotin compounds, such as dibutyl tin dilaurate, are added as stabilizers in the production of vinyl sheet to make the material heat and light resistant.

Foreign Car Uses

European automobile manufacturers in particular have been quick to capitalize on the latest developments in tin applications. For example, an electroplated tin-zinc coating is universally used on directional signals which are subjected to continuous wear and hard weather conditions. This same alloy coating likewise finds use abroad as a coating for fuel tanks and a number of motorcycle parts.

Foreign car makers have also experimented with a tin-nickel electrodeposit which has a good potential as a bright tarnish-resistant coating for automotive trim, bumpers, and accessories. Tin-bronze coatings containing up to 12 per cent tin and a tin-nickel coating containing two-thirds tin and one-third nickel are excellent undercoatings for chromium.



Dip soldering armature assemblies at a Ford Motor Co. plant

These developments in tin-alloy-plated coatings have not yet received widespread attention among American automobile manufacturers. It seems certain, however, that they will eventually be given a trial on future U. S. car models.

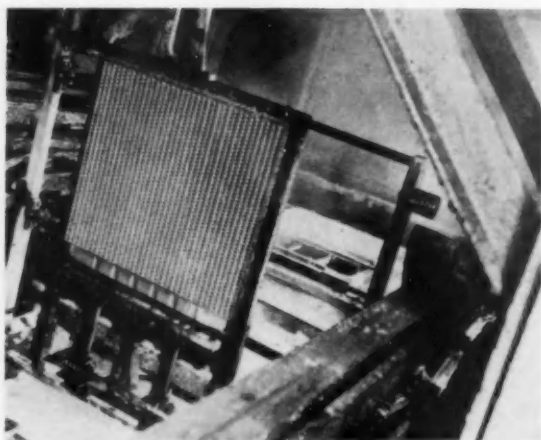
AIRCRAFT APPLICATIONS

Many of the uses for tin that have been described for the manufacture of automobiles can be carried over to the assembly of aircraft. There is, however, a greater dependency on tin because of the intricate electrical and electronic wiring systems used in the operational control of an aircraft. Tin-coated wire and solder, of course, are used in considerable quantities.

While lightweight structural materials are desirable for automobiles, they are an absolute prerequisite for aircraft. Titanium sheet containing 2.5 per cent tin and 5 per cent aluminum is finding expanding applications in jet engine construction and for airframes. The tin improves the machinability and weldability of this high-strength structural alloy.

The tin-coating alloy which finds most use on aircraft parts is phosphor bronze containing up to 10 per cent tin. Phosphor bronze is used in over 30 different applications, among which are bushings, bearings, springs, valves, contacts, thermostats, and switches (see listing).

Two tin alloy coatings have been used on aircraft parts because they have a special ability to resist corrosive attack under severe atmospheric conditions. Hydraulic brake parts and landing gear equipment have been plated with a 75 tin-25 zinc coating with considerable success. An alloy coating of 25 per



Dip soldering core in radiator production at an automotive plant

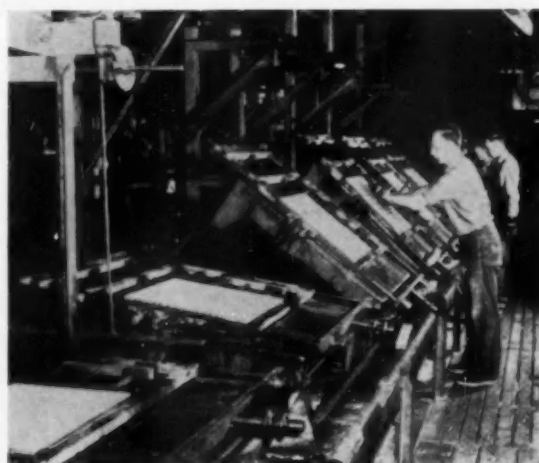


Soldering sidewalls and upper tank on radiator production line

SOME APPLICATIONS OF TIN IN AIRCRAFT

PARTS FORMS

Actuators	Phosphor bronze; silicon bronze; solder
Air conditioning equipment	Solder
Airframes	Silicon bronze; solder
Amplifiers	Phosphor bronze; solder
Annunciators	Solder
Automatic pilots	Phosphor bronze; solder
Auxiliaries	Phosphor bronze; solder
Axle bushings	Phosphor bronze
Bearings	Babbitt; gun metal
Boilts	Naval brass; tin-zinc plating
Buzzers	Solder
Capacitors	Solder
Compasses	Solder
Control devices	Phosphor bronze; solder
Controllable pitch propellers	Phosphor bronze
Diaphragms	Phosphor bronze
Direction finders	Phosphor bronze
Disks	Phosphor bronze
Electric motors	Phosphor bronze
Electrical connectors	Phosphor bronze
Electrical contacts	Phosphor bronze
Electrical systems	Solder
Electronic governors	Solder
Electroplated steel parts	Tin plating
Engine mountings	Solder
Engines	Babbitt; phosphor bronze; tin plating
Filters	Tin bronze; tin plate
Fire extinguishers	Fusible tin alloys
Flight instruments	Phosphor bronze; solder
Fuel line fittings	Red brass
Fuel gauges	Solder
Fuse clips	Phosphor bronze
Fuses	Phosphor bronze; solder
Gears	Gun metal; manganese bronze
Gyroscopes	Solder
Hydraulic brake parts	Tin-zinc plating
Hydraulic jack control panels	Solder
Hydraulic systems	Phosphor bronze; silicon bronze
Ignition systems	Silicon bronze; solder
Indicator lights	Solder
Instrument lights	Solder
Insulated wire and cable	Phosphor bronze; solder; tin coating
Jet engines	Phosphor bronze
Lamps	Solder
Lighting equipment	Phosphor bronze; solder
Mesh grilles	Solder
Nuts	Phosphor bronze; naval brass; tin-zinc plating
Oil filters	Tin bronze; tin plate
Oil line fittings	Red brass
Oxygen equipment	Phosphor bronze; solder
Power packs	Phosphor bronze
Propeller governors	Solder
Propellers	Phosphor bronze
Radar equipment	Phosphor bronze; tin coatings; solder
Radio equipment	Phosphor bronze; tin-zinc plating; solder
Radio tubes	Solder
Rivets	Tin-zinc plating
Signal lights	Solder
Springs	Phosphor bronze
Switches	Phosphor bronze; solder
Tail skid fittings	Manganese bronze
Tubing	Silicon bronze
Turboprop engine bushings	Phosphor bronze
Turnbuckles	Naval brass
Valves	Phosphor bronze; manganese bronze
Welding rod	Silicon bronze



Aligning radiator cores in special jigs in foreground

cent tin-75 per cent cadmium has been used on reciprocating engine parts to overcome the low corrosion resistance of the steels normally used.

A transparent tin-containing electroconductive coating was developed many years ago for aircraft. The thin tin oxide film is applied to glass, and when a low current is passed through the coating, sufficient heat is generated to cause deicing of the windshield. This conductive glass is standard equipment on most commercial and military aircraft.

Acknowledgments

The author wishes to express his appreciation to The Malayan Tin Bureau, 1028 Connecticut Ave., Washington 6, D. C., and the Tin Research Institute, Inc., 492 West Sixth Ave., Columbus 1, O., for their helpful cooperation in supplying data for this article. Both of these organizations will be glad to furnish additional information on tin.

Frontiers of POWDER METALLURGY in USSR

By

Claus G. Goetzel
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Dept. of Metallurgical
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New York University

LAST October I visited the Soviet Union as an observer in the fields of powder metallurgy, cermets and high temperature materials. Since the trip arrangements emphasized physical metallurgy and metallurgical education, plant visits and insight into production methods were restricted to a few cases. The first hand information gathered by me on powder metallurgy relates, therefore, almost entirely to research and development.

Iron powder parts, mainly from atomized cast iron, and iron-graphite and bronze bearings are all apparently manufactured in captive plants of the automobile and tractor industry. Electronic parts, contact metals and brushes are produced in similar captive plants of electronic instruments and electric motor works.

Processing and Testing Techniques

Studies of the processes of compaction and consolidation are in progress at the Kalinin Institute as well as the Baikov Institute of the USSR Academy of Sciences. They encompassed such subjects as powder roll bonding and high temperature pressure-sintering.

Most of the powder rolling experiments were conducted on stainless steel powder. This powder is produced by mechanically disintegrating molten and solidified stainless steel, followed by annealing. On a photomicrograph the powder looks like atomized, hydrogen-reduced powder, about 200 mesh and finer.

The roll diameter is 10 cm on

the horizontal mill. Special guides located immediately after the rolls provided for smooth edges of the product. The facility produces porous as well as dense strip which, after sintering, displayed excellent ductility; the preference is for finer powders. Powder rolling experiments were carried out or planned with other metals, such as Ti, Zr and Be powders.

The up-to-date equipment of the laboratory at the Baikov Institute included, in addition to the horizontally operated powder rolling mill, a conventional hot rolling mill for small strip, suitable for rerolling sintered stock.

Pressure sintering is conducted in a vacuum furnace of one cubic meter capacity equipped with a pneumatic press. This furnace can reach 2200 C and a vacuum of 1-2 by 10⁻⁶ mm with the help of one mechanical pump, one booster pump, and three oil diffusion pumps. The leak rate is given as less than one micron per 24 hours. A pressure of up to two tons is applied to the graphite punches. The

method is particularly favored for large cylinders and test specimens. Optimum dimensions are 25 cm diameter and 7½ cm thickness.

This model is of relatively old construction and power is supplied by induction from a 100 KVA motor generator. The operation is time-consuming and they can only produce two sinterings every 24 hours at best. The furnace finds favor primarily for the investigation of the ternary intermetallic compounds without binder metals as it produces duplicate flat tensile specimens of about 6 in. in length for creep and stress rupture tests.

Testing equipment of interest includes a vacuum hot hardness tester for the determination of plastic deformation at high temperatures. This apparatus was shown to us while in operation on some Ta-alloys. It was unique inasmuch as it could make six simultaneous indentations on six specimens in one test, thereby increasing the output of test data appreciably. Of course, rate of heating, test temperature and load had to be identical for all 16 test specimens. The diamond penetrator was indicated to be of conventional design, the maximum temperature obtainable given as 1000 C.

Also very interesting was a high temperature-stage optical microscope which was demonstrated on some cobalt and nickel alloy samples. The microscope is operative up to 1000 C specimen temperature, which is produced by resistance heating of the horizontally clamped sample. The work is contained in a vacuum chamber, with the polished

(Turn to page 100, please)

MECHANICAL PROPERTIES OF TITANIUM AND TITANIUM ALLOYS FROM METAL POWDERS PRODUCED IN USSR

	Sintered & Forged Ti Ingot	Sintered & Forged Ti-V-Al Ingot	Sintered, Forged & Hot Rolled Ti-V-Al Sheet
Tensile Strength.....	92,000 psi	142,000 psi	156,000 psi
Elongation.....	30 per cent	15-20 per cent	30-40 per cent
Reduction in Area.....	25 per cent	10-15 per cent	20-30 per cent
Brinell Hardness.....	180	210	195

Mack Modernizes Facilities for Cab and Axle Shaft Production

Two modern production facilities, costing about \$1½ million, have been installed by

Mack Trucks, Inc. at the company's main assembly center in Allentown, Pa. One is for truck cabs and the

other for axle shafts. They are part of a long-range plant modernization program now under way.

Cab Facility

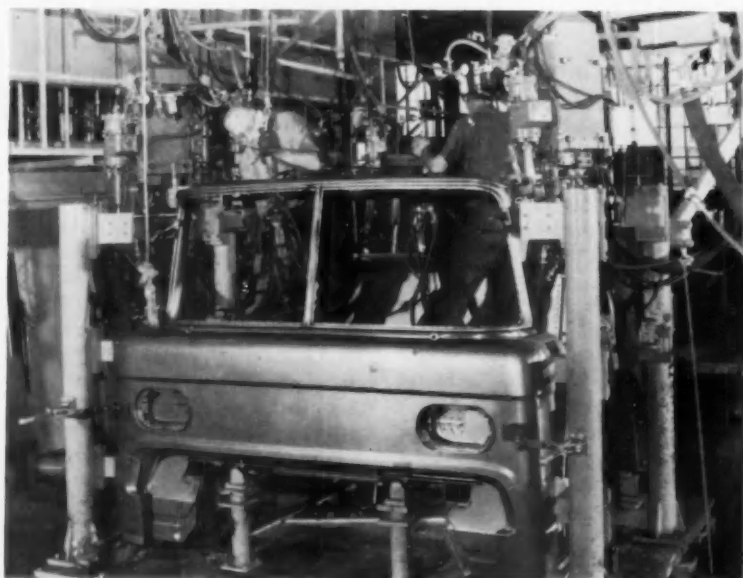
The new highly-mechanized cab line is currently producing five different truck cabs—from the body fabrication stage to final paint and trim. Capacity is 100 per eight-hour shift. Savings in floor space, as compared to the prior setup, amount to about 20,000 sq ft.

In the fabrication section where joining of the cab body sections takes place, spot welders are used for the majority of operations. Welding and holding times are sequenced and electrically-controlled automatically. Latest type jigs are extensively employed, seven being provided for the newest "N" model cab alone.

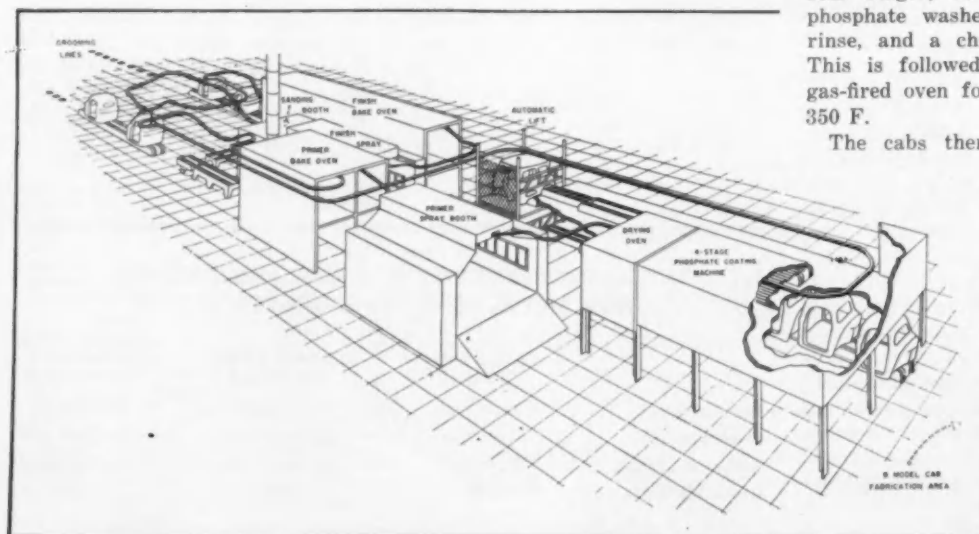
From the fabrication area the cabs are put on a floor conveyor leading into the "mezzanine line." This line is on two levels. Floor level length is 126 ft and mezzanine length 120 ft. Transfer from floor level to mezzanine is by means of an automatic vertical lift controlled by limit switches. Metal finishing and door installation are done in this section.

After assembly, the cabs travel by overhead conveyor through the subsequent metal preparation and painting equipment. First is a 60-ft-long metal cleaning and preparation machine where they receive, in four stages, two alkali and iron phosphate washes, a clean water rinse, and a chromic acid rinse. This is followed by dry-off in a gas-fired oven for five minutes at 350 F.

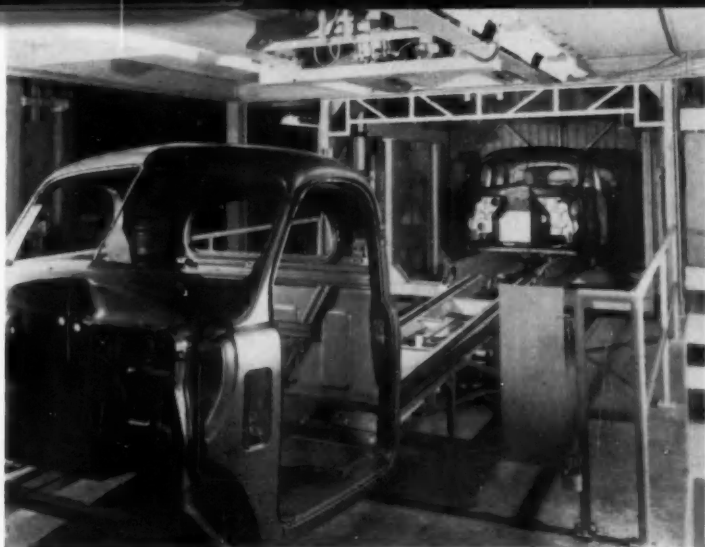
The cabs then move into the



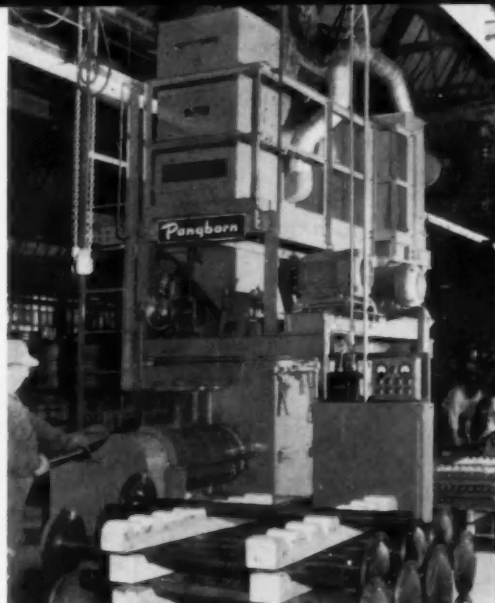
Start of major cab assembly is performed in this fabricating area



Schematic of metal preparation and the painting equipment setup for cab line



Cabs are moved from the fabricating area to the "mezzanine line" via floor conveyor and the automatic lift shown in background



In axle shaft department, modern conveyerized shot peen machine removes scale from axle shafts

primer spray booth where exterior prime coat, interior finish paint, and undercoating are applied.

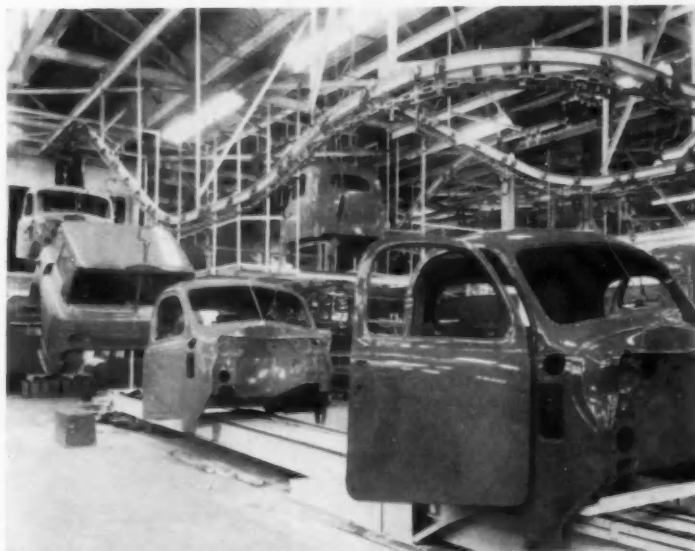
Then after passing through a 38-ft-long primer oven, the cabs go through the sanding booth, a finish spray booth where exterior paint is applied, and the 88-ft-long finish baking oven.

Upon emerging from the baking oven, the cabs are placed on "grooming lines" for addition of trim. At this point the take-off conveyor permits alternate dropping of cabs on the two "grooming lines." Each of these lines is 310 ft long and has 34 stations. Here, operations include installation of wiring, glass, inside linings, cushions, instrument panels, air horns, and lights. After final trimming, the cabs are ready for the main chassis assembly lines.

Axle Shaft Facility

By installation of the new axle shaft manufacturing department, Mack is making these parts in the Allentown factory for the first time. Formerly, the shafts were made at the company's New Brunswick, N. J. plant.

This facility contains some 20 new machines which cost more than \$650,000. Using continuous-line techniques, it is capable of completely machining and processing every type of axle shaft needed for Mack's large line of motor vehicles. Output is at the rate of about 175 shafts per eight-hour shift.



Finish conveyor carries cabs from finish bake oven to "grooming lines" where trim is applied

The two 310-ft-long "grooming lines" hold a total of 64 cabs in process. Here, the trimming is completed, including installation of wiring, instrument panel, cushions, lights, air horn, windows and windshield glass



Newest Equipment Displayed at Coated Abrasive Machinery Show



By
Charles A. Weinert

Air pressure in this inflatable rubber wheel allows the abrasive band to conform to irregular surfaces. (Nu-Matic Grinder, Inc.)

THE 3rd National Coated Abrasive Machinery Show, held on June 10-13, vividly confirmed the growing interest in this type of equipment for production applications. Sponsor of the show was Behr-Manning Co., a division of Norton Co., which appropriately set the stage in the company's new \$1 million product engineering building near Troy, N. Y.

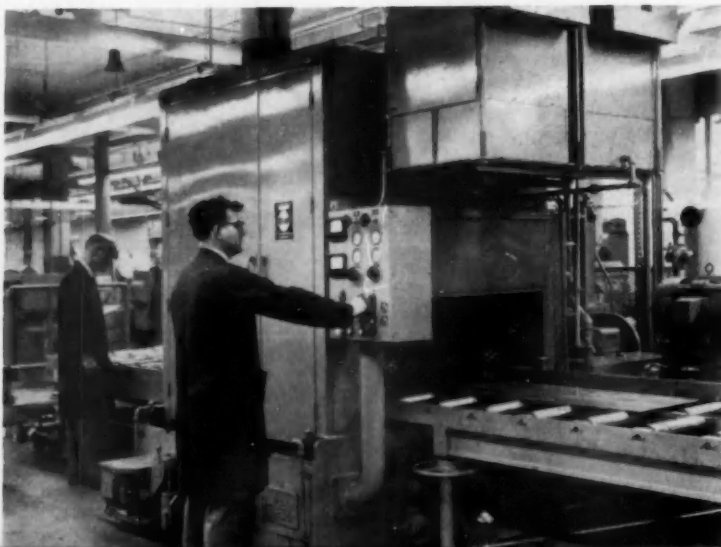
Approximately 150 abrasive machines, a number of which were brand new, were displayed by some 55 different manufacturers. Both metalworking and woodworking equipment had representation.

The abrasive manufacturer acted as host to the machinery industry, having invited the machine manufacturers to demonstrate developments of the past two years. The response from production men was impressive. There were more than 2000 registrations from 23 states and six foreign countries, and from about 1400 companies.

Among the overall significant advances in machine design were those for expanded applications, and close-tolerance work. Frames, bearings and drive trains, in many

instances, have been strengthened to keep pace with improvements in abrasive belts and with the heavier forces being exerted in heavy stock removal. More attention has also

Powered by a 150-hp motor, this heavy-duty pinch roll grinder was developed for mechanical descaling and heavy stock removal. It has a 50-in. wide abrasive belt. (Hill-Acme Co.)



been paid to flooding the work areas with coolants, and to more thorough filtration to remove contaminants from the coolant flow.

One of the top highlights of the equipment on display was a heavy-duty pinch roll grinder for mechanical descaling and heavy stock removal. It was built by Hill-Acme Co. in cooperation with Behr-Manning. The machine is powered by a 150-hp motor, and uses a 50-in. wide abrasive belt. Work may be fed at from 6 ipm to 88 fpm, and the abrasive belt operated at from 1000 to 6000 sfpm. While still in the stages of final development, the machine is felt by its makers to hold considerable promise for descaling, and at the same time finishing, steel sheets; in addition to application in finishing aluminum and difficult-to-handle sheet materials.

A centerless abrasive belt grind-

Right—Rise-and-fall belt grinder was designed to grind almost any curve, angle or radius. It is being used to blend the radii of 3600 jet engine blades per day. A reciprocating table carries the work past a cam-controlled contact wheel. Loading and release are automatic. (Abrasive Machinery, Inc.)

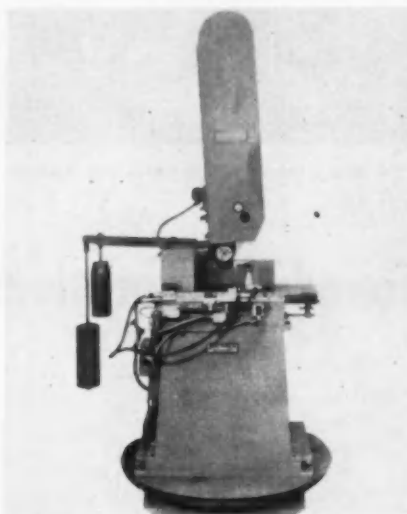
er with automatic infeed and sizing controls was exhibited by Engelberg, Inc. Known as Model 8132 HD, it was designed for precision grinding and finishing of rod or tube stock at through-feed rates of from 4 ipm to 40 fpm. Stock from one to eight inches in diameter can be accommodated. The manufacturer reports that the machine is capable of stock-removal rates as high as two to four pounds of metal per minute. Accuracies to 0.0005-in. were also indicated.

Yates-American Machine Co. featured a 55-in. wide belt sander. This unit utilizes the principle of a multiple drum sander, with a front drum for sizing of flat stock and two abrasive belt heads for cutting down and polishing.

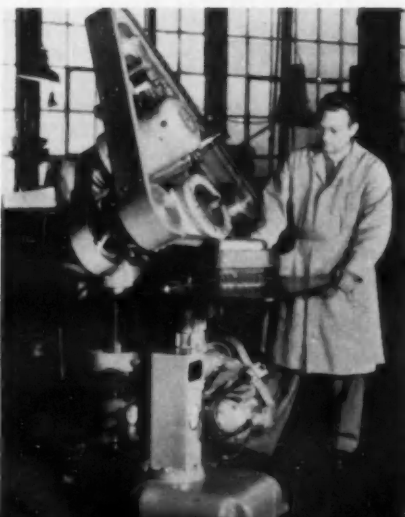
An unusual continuous-feed, longitudinal strip and tube polisher was shown by Kearsarge Engineering Corp. The model at the show had four sets of platens which were



Above—Extreme accuracy is reportedly obtained with a very narrow coated abrasive belt on the Helm die polisher, which grinds and polishes contact surfaces of round-core extrusion and draw dies. Grit lines are parallel with the line of draw. (Hartford Special Machinery Co.)



Below—A powered chuck keeps contoured work in contact with a coated abrasive belt formed by a shaped contact wheel. The chuck can be set to index automatically. (Divine Brothers Co.)



air-actuated and which oscillated in a direction parallel to travel of the work. The four-inch-wide coated-abrasive rolls automatically index in use.

Production Machine Co., in a large display of equipment, had its latest heavy-duty centerless grinder, called Type 614. This machine has powered infeed and outfeed fixtures which assist in feeding heavy workpieces through the unit. Work capacity is 1/4 to 4-in. diam; and it can perform heavy stock removal or microinch finishing.

An extruded shape polisher, designed primarily for polishing square tubing, was featured by Murray-Way Corp. As displayed, the machine had four polishing heads equipped with new Behr-Manning flap wheels. Indexing is automatic; and feed-through rates range up to 20 fpm.

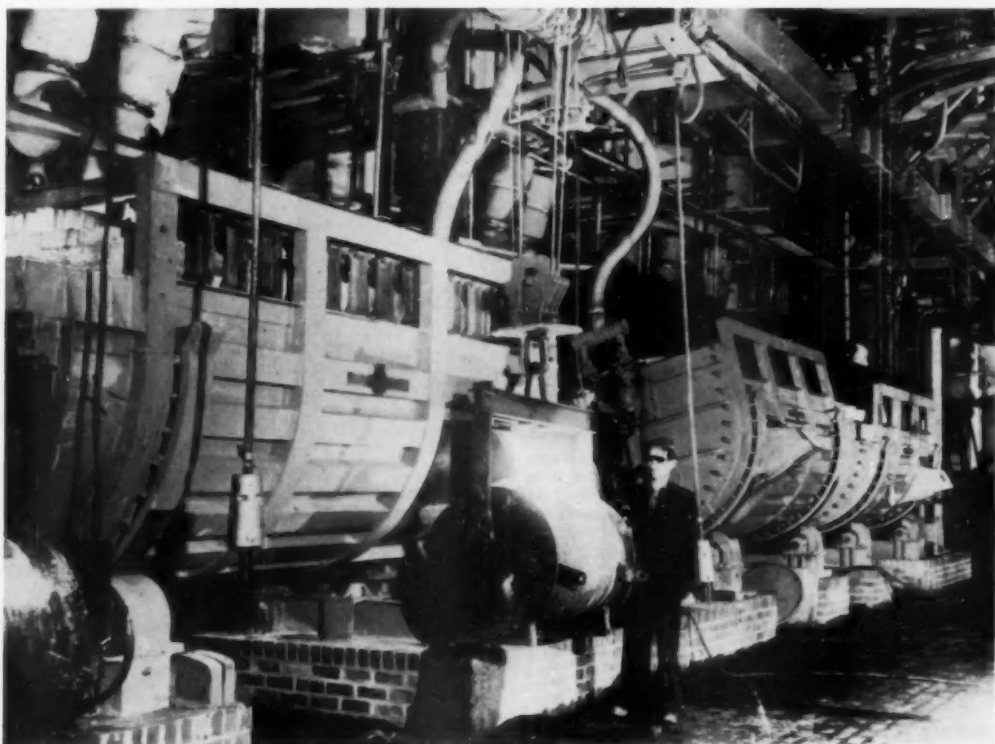
A stroke sander with a 10-ft worktable, and using a six-inch wide belt, was shown by Mattison Machine Works. Usable for polishing of flat metal stock, its stroke length is automatically controlled.

Acme Manufacturing Co. exhibited a combination oscillating arm-fixture-spindle machine for automatically finishing rectangular-shaped parts, using a "Type G-3" abrasive belt head. It was equipped with an automatic wheel feed arrangement. This company also displayed a roller feed unit, which consisted of an Acme G-4 head with a geared chuck, for polishing automotive window frames. Two heads are mounted on one column, permitting polishing both sides at a time. Chucks carry the parts through the machine.

Another contour polisher was the Job-O-Matic, part of the Divine Brothers Co. exhibit. This unit has a powered chuck which moves the work in contact with the abrasive belt until the cycle is completed.

Hammond Machinery Builders, Inc., a big participant in the show, displayed a large extrusion polishing machine. Designed to handle contoured extrusions using abrasive wheels, it has a bed length of 42 ft. The abrasive wheel head is capable of dual motion—recipro-

(Turn to page 102, please)



Metal being poured from one of the four 8-ton receivers into a one-ton ladle from which castings are poured.

Mechanized Foundry Operations at **ENGLISH FORD PLANT**

As part of a \$185 million expansion program announced in 1954, English Ford has now completed its Thames Foundry, which is claimed to be more highly automated than anything in Europe and to be comparable with the most modern in America. The \$20 million plant with 1800 workers has a daily capacity of 400 tons of castings, about half the Ford total output. Manufacture is concentrated mainly on heavy components, such as cylinder blocks, heads and large tractor castings.

The principal building is a two-level structure 1200 ft long and 180 ft wide having steel columns spaced at 60-ft intervals that support lattice girders. These carry most of the sand conveyors, monorails and material storage hoppers, thereby eliminating individual support columns and providing maxi-

mum free working space.

Equipment for melting, molding, core-making and fettling is installed on the upper floor; maintenance and storage areas, offices, etc. are at ground level. A 700 by 60-ft building contains installations for sand handling and drying, and for cooling, grinding and cleaning castings.

A feature of the main building is the air conditioning system that provides a complete air change every eight minutes, and every four minutes in the molding and fettling departments. Steam heaters around the perimeter and over main aisles and doorways compensate for heat losses in winter, while windows and cooling fans are thermostatically controlled to allow for temperature variations. Extractors collect dust at the source, delivering it by ducting to wet-type sepa-

**By
David Scott**

rators. A sluicing system receives slurry from the cupolas and carries it to settling tanks and ponds. The water is then returned for recirculation.

At the start of the production sequence, pig iron, coke and limestone are transported by a telfer system from incoming railway cars to storage hoppers adjacent to the cupola melting furnaces. Skip-hoist machines load pre-weighed charges into the four 108-in.-diameter hot-blast, water-cooled cupolas (two for each working shift).

Each cupola has an eight-ton receiver that pours the hot metal into ladles. These are one-ton containers suspended from monorail-supported electric towing and hoist units for carrying metal to pouring stations. There is also a pig-casting machine that pigs 20 tons of scrap and waste an hour.

Automatic Control

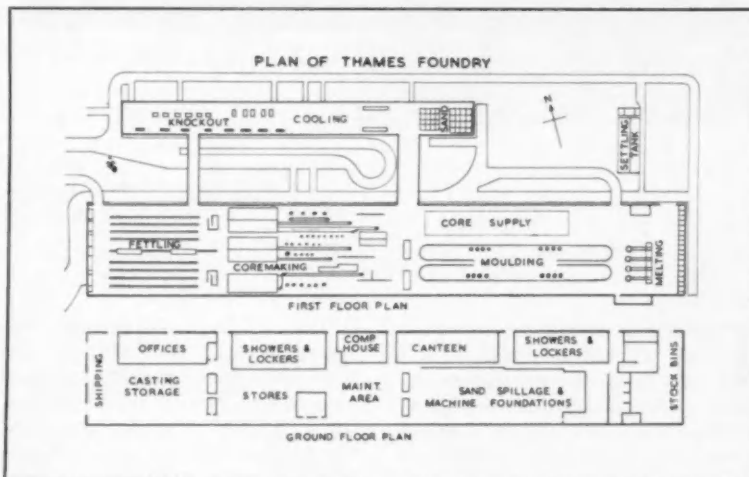
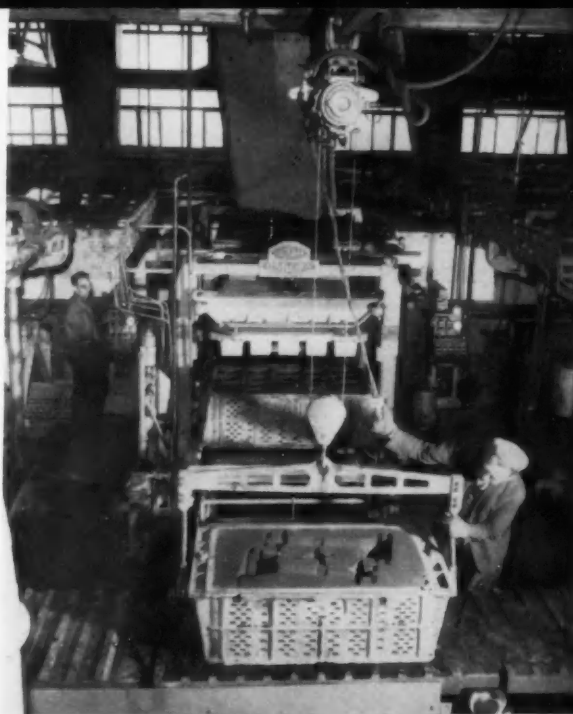
A bank of sand hoppers, located in the center of the floor and supplied by conveyor from the adjacent building, distributes sand pneumatically to the mold and core lines on either side. Sand mixtures are automatically controlled by punched cards which determine the proportion of ingredients for the desired mix.

There are two molding lines, each with eight jolt-squeeze machines (four cope and four drag) working within an 800-ft loop pallet-type conveyor equipped with smoke and fume extractors. Hooks suspended from monorail circuits over the molding lines withdraw the casting from the drags on an elevating section of track. This circuit conveys them to the cooling area in the next building for a three-hour passage, after which they are knocked out and ground. Two further monorails return them to the main floor for the cleaning operations, and finally to eight fettling lines for finishing and, where required, water testing.

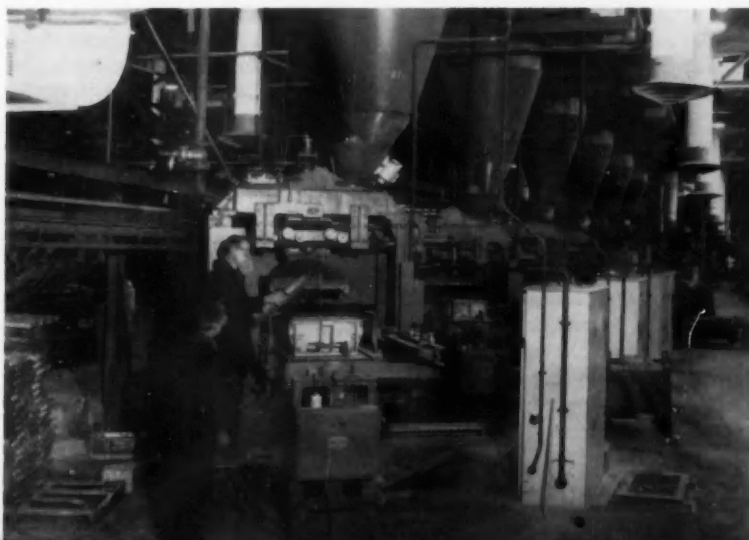
Vertical Core-Blowers

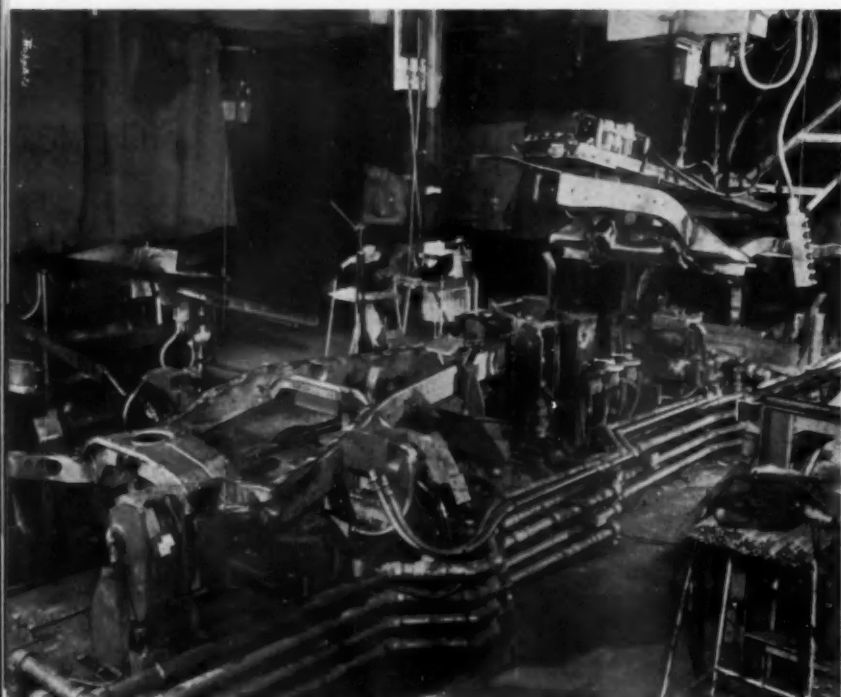
The core shop consists of 39 vertical core-blowers. As in other parts of the new Ford foundry, American equipment is used extensively and includes a number of Flexiblomats made by Beardsley & Piper of Chicago, and Sutter machines produced in Britain under license by Foundry Equipment Ltd. Cores are baked in five continuous horizontal ovens built at an elevated level to facilitate operations and provide storage space beneath. They are painted with a refractory coating which is dried in three horizontal ovens, and finally finished on nine core-grinding machines. A total of 400 delivery racks carries them to the mold assembly area.

One of the 16 automatic molding machines. All are of the jolt-squeeze straight-through type.



Equipment on the coremaking line includes four automatic and six semi-automatic core-blowers and strippers.





Front and rear halves of cruciform frame are joined in a special welding fixture

Efficient Frame Production

PROBABLY the largest supplier of automobile and truck frames to the automotive industries is A. O. Smith Corp., Milwaukee. As with all vendors to these industries, price must be low enough to match competition without sacrifice of quality. This means that the manufacturer must set up an efficient production line, utilizing the best of modern technology to hold costs to a minimum. The company, a long-time supplier of automobile frames, had designed, built, and operated a completely automatic plant for producing riveted auto frames three decades before the word "automation" was coined.

While present frame-making operations are located in several plants, one of the most interesting centers at the company's automotive division in Milwaukee. Here frames are made for the Cadillac, Pontiac, Oldsmobile, Chrysler,

Dodge, DeSoto, and Imperial, and several special models and the Willys. Each of the first three has a separate production line; the Chrysler Corp. cars have two additional lines, and a universal line makes low production special frames. Finally, there are several short lines producing truck frames, which are shipped knocked down.

The frames are made from hot rolled sheet steel, in gages from 0.075 in. to $\frac{3}{8}$ in., the latter for truck frames. For all operations, the steel is first cleaned, pickled, rinsed, and oiled. The sheets are then slit or sheared to the desired width.

The sheet stock for side rails is bought in such size that four pieces can be cut from the width of the sheet. It has been calculated that an excess of as little as a quarter of an inch in the width of the sheet stock for these long heavy members could make the difference be-

tween a profit and a loss on the operation.

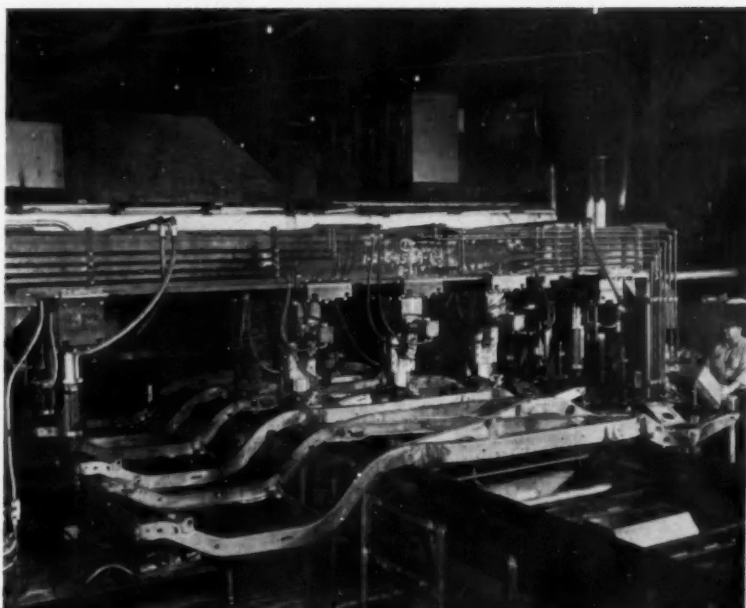
Styling trends in auto bodies have made frame shapes more complex. Formerly, the frame had fairly straight side rails, with some upturn over the axles. Now, with lowered floors, the kick-up has been increased greatly to clear the axles. Side rails in some instances may be carried in the rocker sill area at the sides of the floor pan, so that some parts of the floor pan are actually lower than the rails. In one of the newer variations of the frame, a cruciform shape is developed, with curved front and rear rails joined at a central section. This central section is also the tunnel for the propeller shaft. By locating the forward flare of the rails under the hood, and the rear flare under the rear seat and

trunk, with a longitudinal tunnel down the center of the floor pan, the floor pan can be slung lower than the frame.

It seems to be the opinion of many engineers that auto bodies have been carried about as low as they can be, consistent with good engineering.

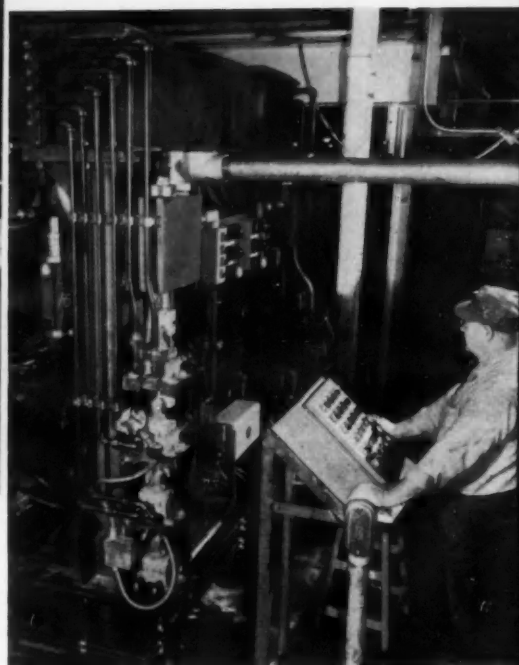
Production of the cruciform frame for Pontiac is typical of procedures in the frame plant. Seven styles of frames are made on this line for Pontiac, all of the cruciform type. Each side bar is made in two pieces, front and rear, and the two front rails are first joined together, then married to the two rear halves by welding at the tunnel.

Steel strips are first blanked in a 1000-ton Clearing press, then drawn to channel form in a 1200-ton Bliss-Marquette press. The formed pieces then move to a link belt line and are carried through



Frame straightener, designed by A. O. Smith men, can straighten from 200 to 250 frames per hr; six clamps grip frame while four probes check alignment at corners

One operator controls straightening operation from pushbutton panel



Lines at A. O. Smith

subsequent operations. The first of these is the piercing of holes not done in blanking, in hydraulic piercing units. Front halves of the side rails are then boxed and welded to form box section members, and the two rear rails are joined by manual arc welding also. In the next operation the front and rear rail subassemblies are placed in a fixture in which the side rails overlap at the sides of the central member—the tunnel—and upper and lower tunnel plates are added to form the tunnel. All members are manual arc welded while in the fixture, and the frame comes out of the fixture in cruciform shape.

The frame is again carried on the belt line to the next station, where outriggers for the rear suspension are welded in place. These are critical as to location. The line is broken at this point, the parts being taken to the second floor by elevator, and there started on an

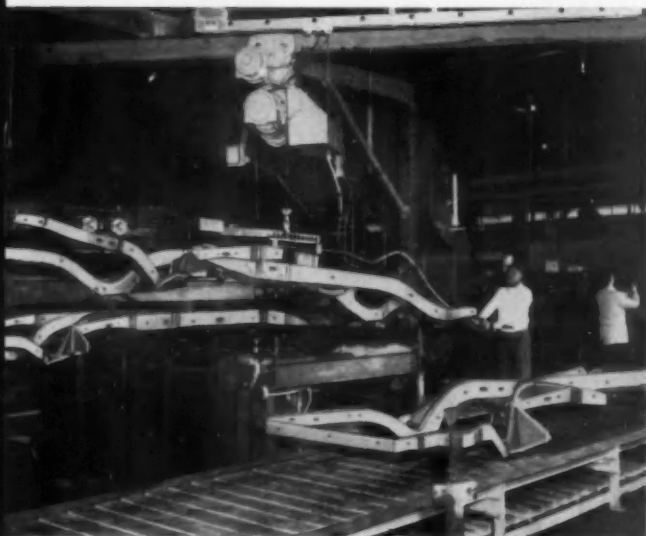
extension of the line that doubles back over the line of travel on the floor below. They move into an area in which a succession of booths is arranged over the line, and the frame is lifted on an elevating fixture about four feet into the work zone. Each booth has a front and a rear walkway extending across the line of travel of the conveyor belt, and three weldors stand on each walkway to complete the welds in the tunnel area, so that six weldors work on the frame simultaneously. As the work is completed, the fixture lowers the frame to the conveyor line, on which it is conveyed to a turnover fixture that inverts it. It is then conveyed to another booth area, in which a similar elevating fixture raises the frame into a booth and six weldors complete welds on the under side of the tunnel area.

These booths are so arranged that one frame is raised into the

first booth, and the conveyor carries the next frame under the first booth and to the second in line, where an elevating fixture lifts it from the conveyor and into the booth. This happens with each succeeding frame until the four booths are engaged in turn. The frame in the first booth will by this time have been completed and lowered to the conveyor, and the next frame will then be raised into the first booth. After the turnover fixture, four more booths are similarly occupied in succession to weld the under side of the frame.

This completes the fabrication of the frame. An inspection station is next on the conveyor line, and any frames failing to pass visual inspection are removed from the line for repair. A straightening press is built into the line at the next station. In this a sensing device indicates the amount of horizontal deflection at each corner (height), and by means of quick-acting hydraulic cylinders deflects the frame enough to straighten it.

(Continued on next page)



Finished frames are unloaded from production line to slat conveyor, prior to painting



Special industrial trucks stack frames in storage yard

Four light recorders, one indicating for each corner of the frame, indicate when the four corners are in the same plane. The operation is very rapid, as there are several cycles of sensing and deflecting in each second. A similar device then senses and straightens the frame laterally. The frame then goes to the paint machine, where it is given a heavy coat of paint.

As an additional check upon process controls and the visual inspection, a percentage of the total production is given a complete inspection in a large fixture gage. Other quality and procedure controls are the use of photos to show the required bead location in intermittent welds, and destructive tests to determine quality obtained by various welding procedures.

The same general procedures are followed on all of the production lines. For the short lines doing truck frame production, the steel is heavier, and heavier presses are necessary to form it. Truck frames are shipped as formed and pierced side rails with separate cross members. This gives the truck builder flexibility in producing frames for various models, using basic parts.

Chevrolet Motor Builds 39 Millionth Vehicle

A gold Corvette was the 39 millionth vehicle built by Chevrolet Motor Div. The sports car came off Chevrolet's St. Louis line June 11, roughly 47 years after the first Chevrolet car was built and 5½ years after the first Corvette.

The first car, the classic "6" five-passenger touring car, was built in a loft in Detroit by W. C. Durant, engine-designer Louis Chevrolet and a small group of associates.

Production in St. Louis began in 1918 and at the present plant in 1920 when 25,500 vehicles were assembled. Since then, the St. Louis plant has turned out more than 5,610,000 cars and trucks, including nearly all the Corvettes.

The first Corvette was hand-built in time for GM's 1953 Motorama, and

by June the division's Flint plant was building the sports car while St. Louis was being readied for production.

Through June 11, Chevrolet's 1958 production topped 800,000 units, including some 140,000 trucks and 5,000 Corvettes.

Curtiss-Wright Will Transfer Scraper Operation to Indiana

Curtiss-Wright Corp., in another diversification step, will transfer its new earth-moving operations from California to South Bend, Ind. The company will manufacture the Wooldridge line of scrapers and other heavy construction equipment in its Aircraft Engines parts plant, leased from Studebaker-Packard Corp.

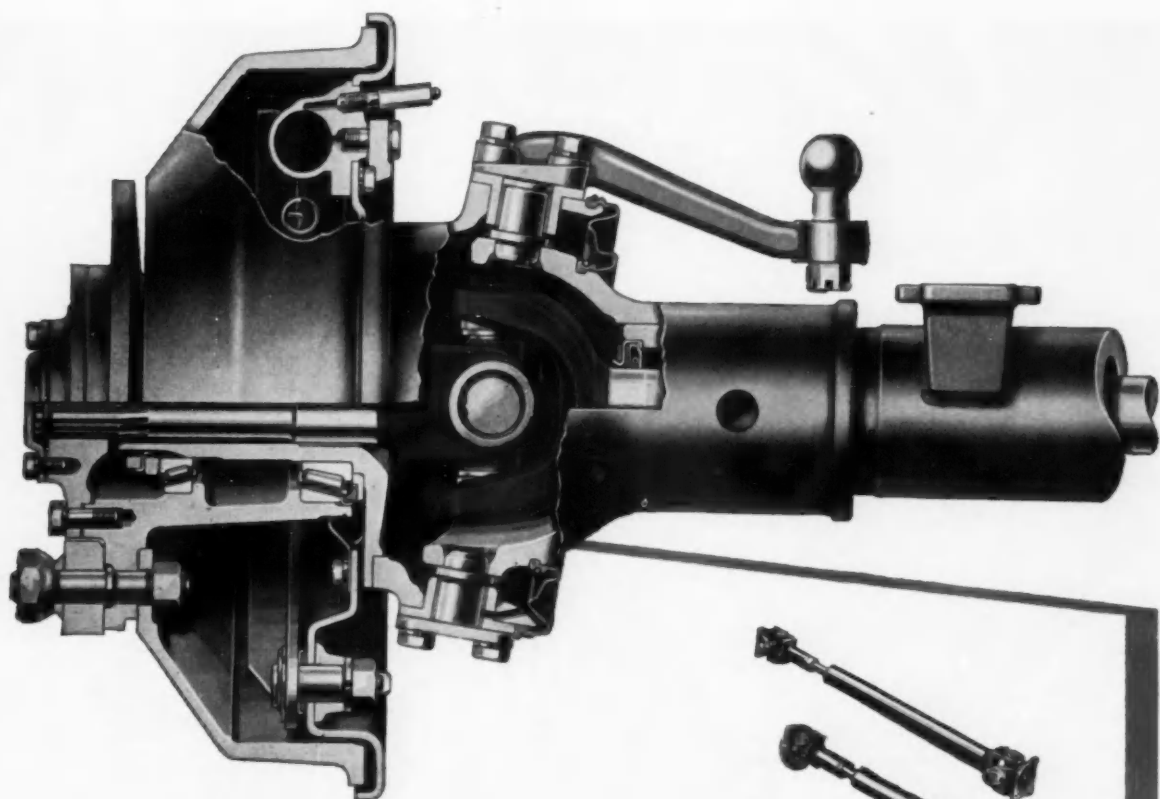
C-W bought the Wooldridge Division from Continental Copper and Steel Industries last month, but the transaction did not involve the Sunnyvale, Calif., plant site.

IRS Rules "Mailster" Subject To Manufacturers Excise Tax

Mail delivery trucks with three wheels are just as susceptible to the manufacturers' excise tax as are four-wheeled vehicles.

Post Office Dept. has been buying in quantity a three-wheeled motor vehicle called a "mailster." This small vehicle, with a cargo compartment measuring 40 cu ft, transports 500 lb of mail.

The mailster has a front wheel and two rear wheels, axle-driven by a small gasoline engine. It has the characteristics of an automobile truck, the Internal Revenue Service decides. A new ruling, Revenue Ruling 58-284, says sales by the manufacturer of the mailster are subject to the excise tax.



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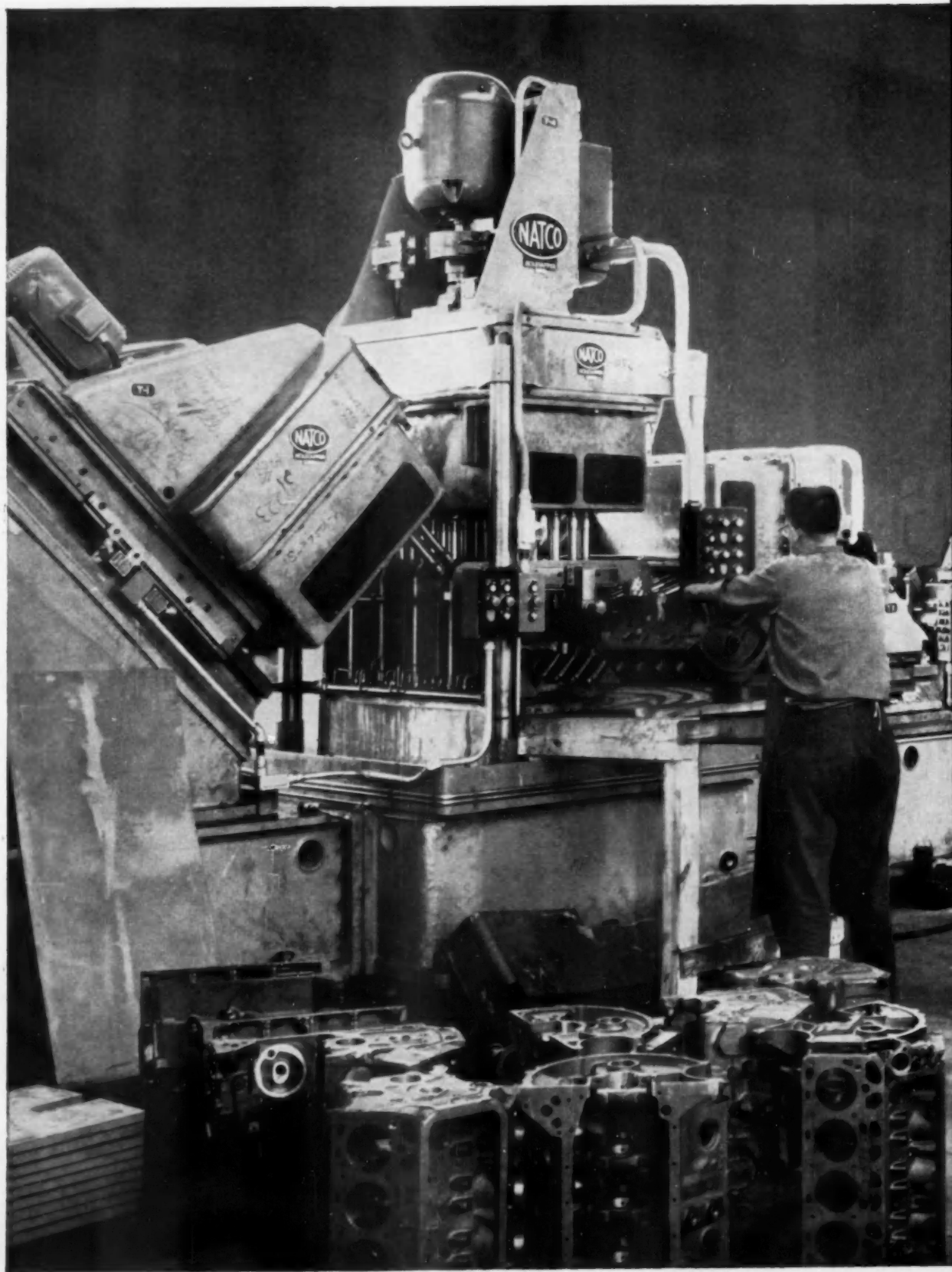



Blood Brothers Universal Joints

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Must your transfer machine go to scrap every time your model changes?

Certainly not. For example, the way-type machines shown here were once stations in an automated straight-line transfer machine. Now they will begin their second life as individual machines on a shorter-run lower-production assignment.

Each station in your Natco transfer machine—whether drilling, boring, milling, sawing or chamfering—is a machine tool in its own right. With modifications and new tooling, it may serve you for many years beyond its original “single-purpose” life.

When product changes call for new tooling, consider adapting the previous machinery to a new use—and realize substantial savings. Natco engineers and manufacturing facilities are at your disposal to make the necessary modifications. Call your nearby Natco representative today to discuss converting your equipment.

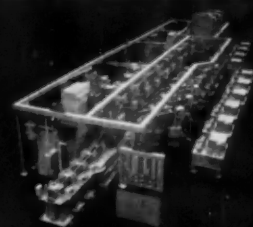


Multiple-spindle drilling, boring, facing and tapping machines. Special machines for automatic production.

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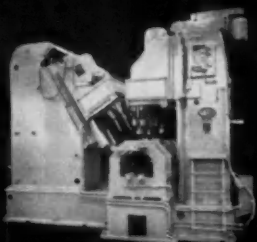
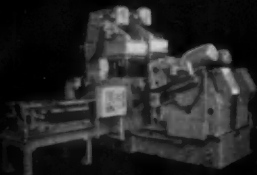
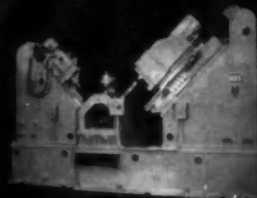
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Natco offices in Chicago, Detroit, Buffalo, New York, Boston, Philadelphia, Cleveland and Los Angeles. Distributors in other cities.

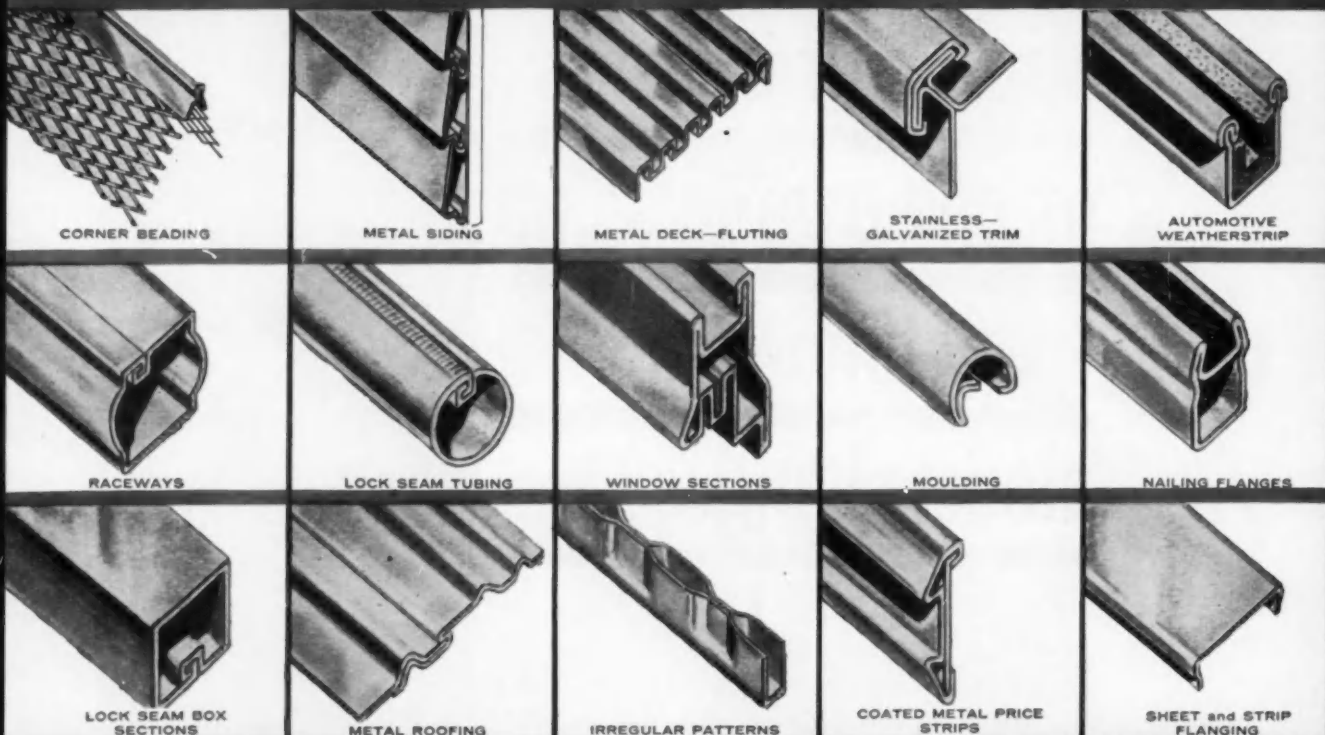


FROM TRANSFER MACHINE

TO THESE WAY-TYPES



The Shapes of Things to Come



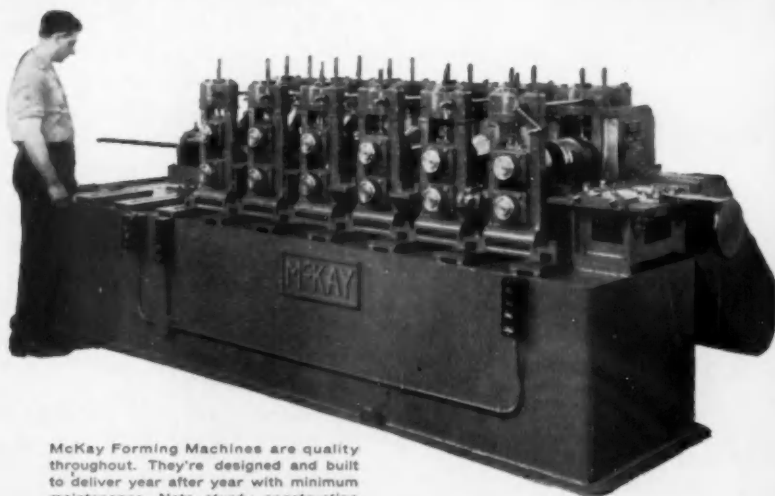
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McKay Forming Machines are the last word in quality. They're designed and built to perform with extreme accuracy year after year. McKay users the world over know that quality is never sacrificed, even in the smallest details, for the sake of marketing a "cheaper" unit.

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Be sure you have checked with McKay before you order forming equipment. You'll find this unmatched precision and ruggedness pays off in better forming at greatly reduced costs. And with a McKay—you're ready for tomorrow!



McKay Forming Machines are quality throughout. They're designed and built to deliver year after year with minimum maintenance. Note sturdy construction of machine pictured above.

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FREE LITERATURE

Air-Hydraulic Cylinders 1

Two Bulletins, 107 and 108, are available from the Ortman-Miller Machine Co., Inc. Bulletin 107 describes Series RA heavy-duty air cylinders for 200 psi operation while 108 features Series RH heavy-duty hydraulic (oil) cylinders for 1000 psi operation.

Transmissions 2

Form 114, 10 pages, presents information on the complete line of single-stick, semi-automatic Road-Ranger Transmissions which are designed for use on over-the-highway and off-the-highway equipment. *Fuller Mfg. Co.*

Ball Bearings 3

Cartridge ball bearings with dual labyrinth seals are explained in detail in Bulletin 104 issued by *Hoover Ball and Bearing Co.*

Die Casting Machines 4

A complete line of toggle type dye casting machines is covered in Bulletin 23.10, six pages. *Lake Erie Machinery Corp.*

Rotating Equipment 5

Rotating and control equipment for the manufacturing, marine and aviation industries is described in a six page brochure, Form 4988, issued by the *Electrical Div. of Safety Industries, Inc.*

Precision Index Table 6

Catalog 302 describes design characteristics of the roller gear drive indexing mechanism in a line of index tables and rotary transfer machines for high speed, precision assembly and manufacturing. *Ferguson Machine Corp.*

Arc Welding Titanium 7

An eight page technical brochure discussing the method and techniques used in arc welding titanium has been published by *Mallory-Sharon Metals Corp.*

Heat Treating Equipment 8

Bulletin 242, 22 pages, contains photographs and describes hardening, carbonitriding and carburizing furnaces of batch and continuous types. *Lindberg Engineering Co.*

Coated Wire 9

A four page brochure describes a line of Teflon-coated wire. It gives sizes available, new engineering data, pointers on wire and cable design, and typical uses of Teflon-coated wire made by *Chemplast, Inc.*

Cylindrical Grinders 10

Catalog B-571, 20 pages, describes and illustrates a line of plain cylindrical grinders. Includes complete specifications. *Landis Tool Co.*

(Please turn page)

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Drilling-Tapping 11

Bulletin 5810, 28 pages, features full page illustrations covering a line of automatic drilling and tapping equipment and related accessories. *Hypneumat, Inc.*

Pump Line 12

Catalog 100, 12 pages, contains basic data on a complete line of pumps, fluid motors and valves. *Tut-hill Pump Co.*

Lockers, Cabinets 13

The Penco lines of steel lockers, cabinets and shelving are described in a folder issued by *Penco Metal Products Div., Alan Wood Steel Co.*

Industrial Clothing 14

An eight page catalog featuring a line of industrial protective clothing has been prepared by B. F. Goodrich Industrial Products Co. The catalog shows work suits, raincoats, gloves and aprons used in industry. *B. F. Goodrich Industrial Products Co.*

Chipless Metal Shaping 15

Bulletin 900-P2, four pages, discusses three processes for chipless shaping of metal: upset forging, stamping and the Rotoform process. The advantages of each are discussed and typical examples are pictured and described. *Commercial Shearing & Stamping Co.*

One-Ton Multipress 16

Bulletin 310-A, eight pages, describes the operation and application of the 1-ton Denison Multipress. Application suggestions on the use of the press for all types of metal forming and assembly operations are included. *Denison Engineering Div., American Brake Shoe Co.*

Balanced Vane Pumps 17

Vicker's line of "High Performance" balanced vane pumps, which operate at speeds up to 2000 rpm and pressure to 2000 psi, is described in Bulletin M5108. *Vickers Inc.*

Electrical Devices 18

Catalog 58, eight pages, contains descriptive data and explains usage of various types of Trico electrical and lubricating devices. *Trico Fuse Mfg. Co.*

Barrel Finishing 19

Bulletin No. 158, eight pages, describes the full line of Lorco equipment for precision barrel finishing. *Lord Chemical Corp.*

Test Equipment 20

Booklet B-7269 describes various test equipment for the aviation industry, including wind tunnel equipment, elevated temperature structures test facilities, and equipment for rotating test stands. *Westinghouse Electric Corp.*

Overhead Conveyor 21

The Conveyor Div. of The American MonoRail Co. has published a 44-page catalog CDA, which describes their "Cable-Way" overhead conveyor. Features of the conveyor are low cost, ease of installation, quiet operation and long life.

Four-Column Presses 22

Bulletin H-5000, four pages, details the important features of a line of four-column type hydraulic presses. In addition, a page of specifications on the popular standard sizes is included. *A. B. Farquhar Div., The Oliver Corp.*

Slitting Lines 23

Slitting lines for coil and sheet are described in a 76 page handbook. Design, selection and operation of slitters and slitting lines, time studies, analysis of operating cycles and methods of coil handling are included. Also scrap disposal and other operating data. *The Yoder Co.*

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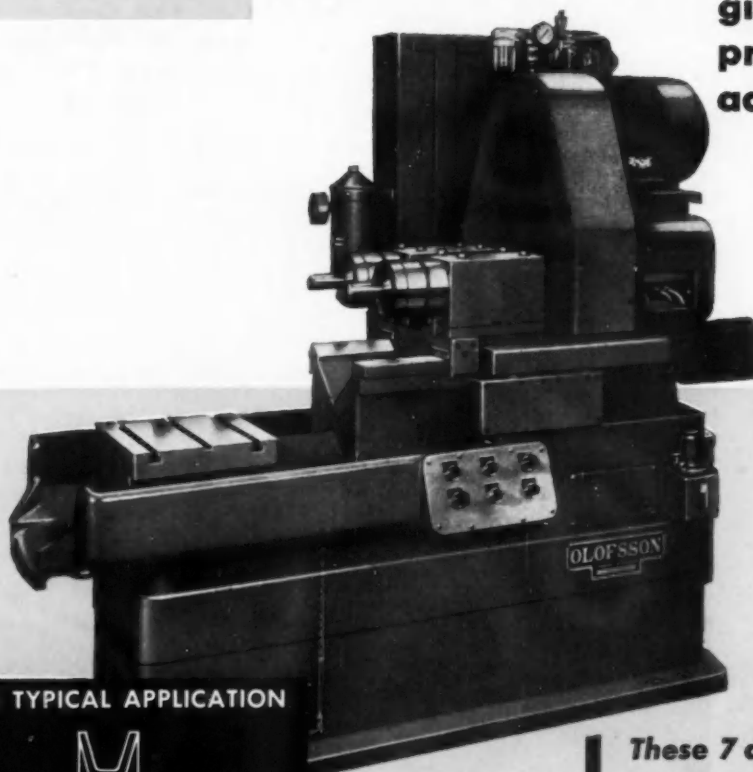
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OLOFSSON Precision Boring Machine gives added production advantages



**OLOFSSON Model 30-012
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Finish bore, turn o. d.,
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These 7 design features give you greater production efficiency . . .

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News of the MACHINERY INDUSTRIES

By Charles A. Weinert

How and When Aspects of Machine Tool Obsolescence

Several interesting comments on machine tool obsolescence were presented by two of the speakers at the recent Westinghouse Machine Tool Forum. We believe some of the points made in that connection are worthy of mention at this time. (Report on control systems and devices discussed at the meeting was contained in *AUTOMOTIVE INDUSTRIES* of June 1, page 62.)

One of the speakers was K. C. Butterfield, staff master mechanic, Chrysler Corp. The title of his talk was "Current Problems in Machine Tool Obsolescence." The subject was approached from the viewpoint of the user and how obsolescence was affected by both economic conditions and technological developments.

Sources of Obsolescence

In referring to the current recession, he indicated that with reduced product demand "a lot of machines" have been idled and are surplus to present needs. And that since most corporations are taking steps to keep abreast of the productive scene, some of these steps can bring about obsolescence of the surplus machine facilities.

Mr. Butterfield said the ways in which this obsolescing may take place are generally: (1) re-arrangement for lowered volume production; (2) re-arrangement as part of a forward plan; and (3) replacement of over-age machines.

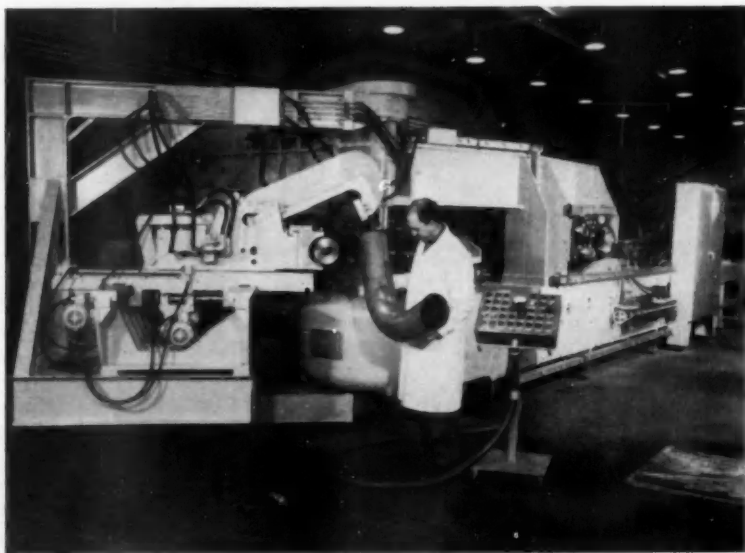
In the first instance, it is natural to re-arrange plant facilities to utilize the best features of existing lines and individual machines. The oldest and least productive will be idled in times of low-volume requirements. This, in turn, invariably

results in a residue of machines not currently required for production, of older vintage and lesser capabilities. These surplus machines might be held for a time, but in the speaker's opinion they would ultimately be disposed of in favor of newer, up-to-date equipment when the market called for more output.

Discussions of Machine Tool Obsolescence at Ma- chine Tool Forum Set Out Some of the Causes of Obsolescence and Reasons Why Replacements Are Advantageous

The second kind of obsolescence will occur whenever a concern has a continuing forward-moving plan for re-arranging and replacing equipment to improve its competitive position. This can advantageously be accomplished during reduced-volume periods "if planning for and setting aside the necessary funds has been done during more profitable high-volume periods."

The third, and last, main source is replacement of machines "just
(Turn to page 95, please)



Large Tube Bender Built for Making Aircraft Ducting

Pines Engineering Co., Inc., recently built for an aircraft manufacturer this tube bending machine, reputed to be the largest ever constructed. It can form 8-in. OD by 0.020-in. thick stainless steel tubing on a 16-in radius, in fabricating air and fuel ducting for jet aircraft. Incorporated in the machine are a direct-acting hydraulic pressure die, a direct-acting C-frame clamping die, and motorized tool adjustment. Pushbutton control of machine adjustment includes both longitudinal and lateral movement of the pressure die,

the clamp die, and the mandrel carriages.

Pictured is the right front view of the machine. Control panel in foreground permits either manual jog or fully automatic operation. Panel also has control switch for regulating the bending speed—which is infinitely adjustable. A separate setup control panel (not shown) is used for establishing pressure settings of the tube booster (which applies pressure to the end of the workpiece during the bending cycle), pressure die, and clamping die.

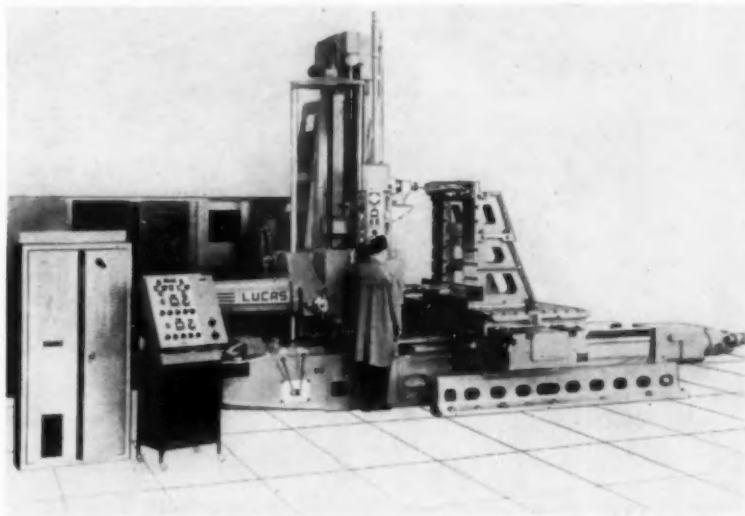
NEW

PRODUCTION and PLANT

EQUIPMENT

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 73

Program Controlled Boring, Drilling, Milling Machine



A complete line of table-type and floor-type horizontal boring, drilling and milling machines offered by the Lucas Machine Tool Div. of The New Britain Machine Co. is equipped with General Electric program controls. Machines can be furnished with tracer equipment, numerical positioning equipment (punched tape) or numerical contouring equipment (magnetic tape).

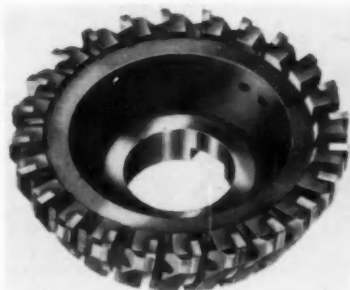
Circle 30 on postcard for more data

Dye Inspection Material

MAGNAFLUX CORP. is offering an improved line of dye penetrant inspection materials which is available in nonflammable or very-high flash point formulas in either pressure-spray cans or in bulk. Named Spot-check, the line provides a convenient method for locating cracks, seams, porosity and other defects in almost any solid material. It is also non-toxic.

Circle 32 on postcard for more data

Milling Cutters



Viking fine pitch inserted carbide shell end mills and end mills are designed for high feed surface milling of cast iron. The fine tooth spacing permits high feed rates without sacrificing surface finish. The cutters are made in diameters ranging from 4 to 20 inches. (Viking Tool Co.)

Circle 33 on postcard for more data

Machine Flash Welds Hot Rolled Steel Rings



This automatic flash welder, named the 400 KYA-FS is designed for flash welding hot rolled steel rings $\frac{3}{8}$ in. thick up to 8 in. wide, also flat stock. The double acting hydraulic cylinder provides approximately 38,000 lb upset force. The weld power interruption, upset travel, hold time on the clamp after completion of the weld, hold time after release, flashing cycle and the flashing curve are all adjustable and calibrated, making duplication of setup simple. (The Federal Machine and Welder Co.)

Circle 31 on postcard for more data

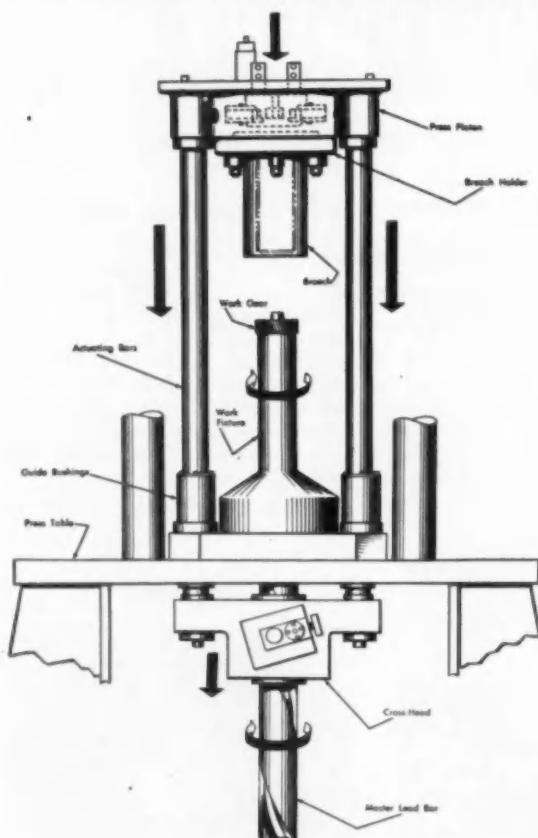
Coupling Preamplifier

MODEL 450-1300 DC Coupling Preamplifier is designed for use with optical oscillographs, tape recorders, oscilloscopes and other indicating devices.

It is a moderate gain, balanced input-balanced output DC amplifier, which will perform well with single-ended or balanced signals. Frequency response is 0-10 kc; linearity, $\frac{1}{4}$ per cent. Plus or minus zero suppression, to 20 times full scale voltage is included. Calibration is provided by a 100 mv internal signal. Industrial Div., Sanborn Co.

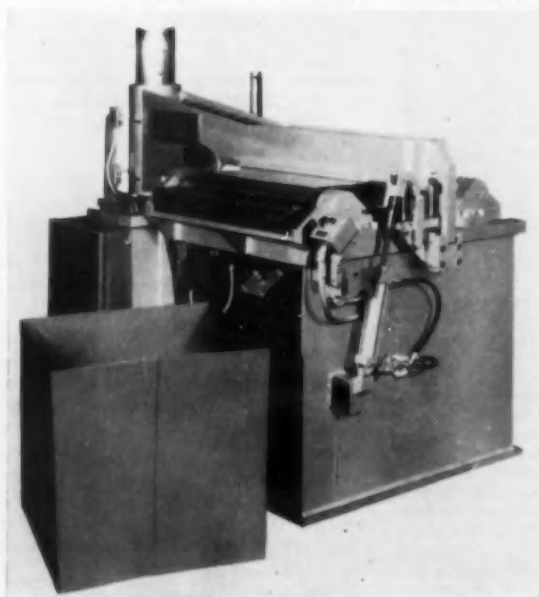
Circle 34 on postcard for more data

Broaching Process Produces External Gears in 5 Seconds



This Red Wing broaching process produces external helical gears in a very short cycle time. In its initial application it produced an 87 tooth, 24 pitch, 22 degree helix angle, 4 in. OD cast iron helical gear having a $\frac{3}{4}$ in. face width in a five second cutting cycle. The use of a solid high-speed steel hollow broach in which many broach teeth are ground from the solid is the main feature of the machine. The process can be applied on a conventional vertical hydraulic press. A check of ten gears made by the broach showed maximum tooth pin size variations of 0.0009 in., a maximum variation in lead on both sides of teeth of 0.0008 in. and maximum involute variation of 0.0003 in., it was reported. Finish broached gears are raised by the broach to the top of the stroke and ejected automatically by an air cylinder arrangement into the chute at the front of the broach head. (National Broach & Machine Co.) Circle 35 on postcard for more data

Air Operated Tangent Bending Equipment

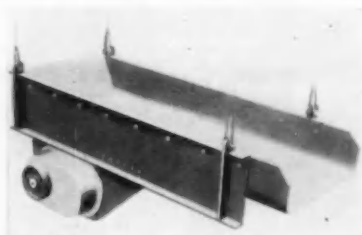


Model 6 ASW 2 bending machine, pictured is an open-end single-wing tangent bender designed for narrow products less than 6 in. wide, such as tubing, angles, channels, etc. It needs no front clamping mechanism and has a rapid operation cycle. Other air-operated machines in this line include the conventional single-wing, the duplex and the quadruplex tangent benders which will handle material from 24 to 48 in. wide. (Taylor - Winfield Corp.)

Circle 36 on postcard for more data

Vibrating Feeder

STRAIGHTLINE geared counterweight vibrating feeders are designed for feeding a wide range of bulk materials at high rates. Capable of absorbing great impacts, the unit can be



Link-Belt straightline vibrating feeder

mounted directly under a hopper or bin to feed, convey, pick or scalp materials. A geared eccentric shaft mechanism produces a high intensity straight-line stroke that ranges in amplitude from $\frac{1}{4}$ to $\frac{1}{2}$ in. up to 900 rpm. The feeder can be floor supported or suspended by cables from bins, tanks or hoppers. Link-Belt Co.

Circle 37 on postcard for more data

Abrasive Belt Grinder

THE Engelberg Model 696 abrasive belt grinder, available with from two to six or more individually adjustable grinding heads, offers an extensive capacity range, handling parts up to 5½ in. maximum width and 6½ in. maximum thickness. The machine's conveyor belt, which carries parts under the grinding heads, is powered by a $\frac{1}{2}$ hp variable speed motor, and is adjustable for feed rates from 0 to 67 fpm.

Speed of the 6 by 96 in. abrasive belt is 5400 sfpm. Machine drive is 7½ hp, 3600 rpm, with 10 or 15 hp optional. Engelberg, Inc.

Circle 38 on postcard for more data

Miniature Bench Center

AN instrument type bench center has been developed for use in inspecting miniature parts which are machined on centers. Designated No. 9205M, it checks concentricity, run-out and squareness of face to axis, or outside diameter of the miniature and sub-miniature parts and components now being used in missile, electronic and aviation assemblies. Work capacity is eight in. long by three in. in diameter. The Taft-Peirce Mfg. Co.

Circle 39 on postcard for more data

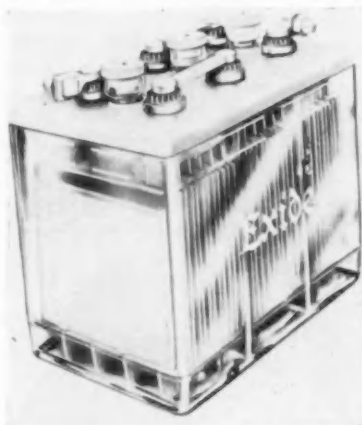
Glow Discharge Unit

THE LC-031 glow discharge unit is capable of delivering 400 ma at a full 5000 volts dc. The unit aids operators of large vacuum coaters. It will bombard the surface with a high velocity due to high accelerating voltage, resulting in a clean surface for coating. *Consolidated Electrodynamics Corp.*

Circle 40 on postcard for more data

Industrial Battery

FLAT-PLATE storage batteries designed for small power applications, designated PWA feature corrosion resistant grid material, an explosion control device and shock-absorbent plastic containers. PWA batteries are available in 50 and 100



PWA battery for small power applications

ampere-hour capacity sizes. *Exide Industrial Div., The Electric Storage Battery Co.*

Circle 41 on postcard for more data

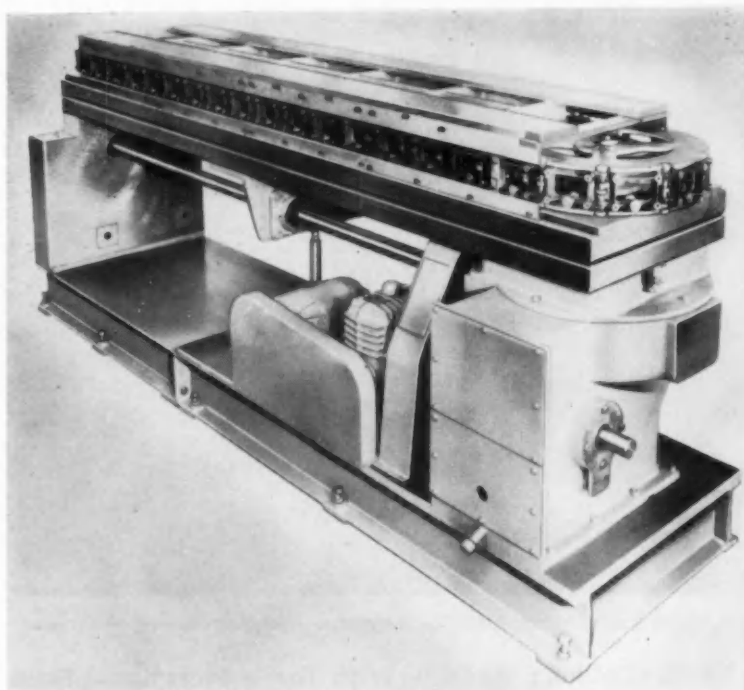
Precision Boring Head

PRECISION boring heads made by Briney Mfg. Co. can either finish bore a hole on the withdrawal stroke or retract its tool-bit to prevent marking of the finished bored hole as the head is withdrawn.

In operation, the retracting feature is used to eliminate tool drag lines on hole surfaces caused by bar deflection when boring tools are withdrawn from the finished work. In many cases, this feature also makes possible the elimination of secondary finishing operations such as grinding and honing.

Circle 42 on postcard for more data

AUTOMOTIVE INDUSTRIES, July 15, 1958



Standard tool conveyor type cam-operated precision indexing chassis, Model ST-A18

Conveyor Type Cam-Operated Indexing Chassis

MODEL ST-A18, a cam-operated precision indexing chassis is available with either 27, 35, 43 or 51 work carriers. The carriers are integral with the conveyor chain links which

position the work to each station. Cam shafts, two inches in diameter, are provided for tool actuation. *Standard Tool & Mfg. Co.*

Circle 43 on postcard for more data

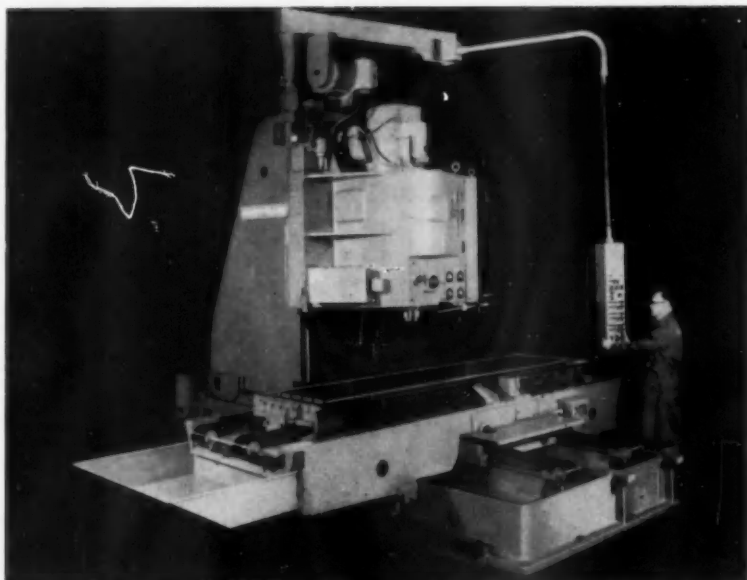
Machine Automates Socket Set Screw Driving

The Setomatic, a new machine developed by Standard Pressed Steel Co., automatically feeds, inserts and tightens socket set screws ranging in diameter from approximately 0.138 in. up to $\frac{3}{8}$ in., in lengths up to $\frac{3}{4}$ in. It can make up to 2500 complete installations an hour in as many different product assemblies. The Setomatic is suited for use either as an attachment to a single machine or as an integral part in a continuous or fully automated production line.

Circle 44 on postcard for more data



NEW PRODUCTION and PLANT EQUIPMENT



Sundstrand OM5 vertical Rigidmil is designed for heavy cuts on large work pieces

Vertical Milling Machine With Three Directional Feed

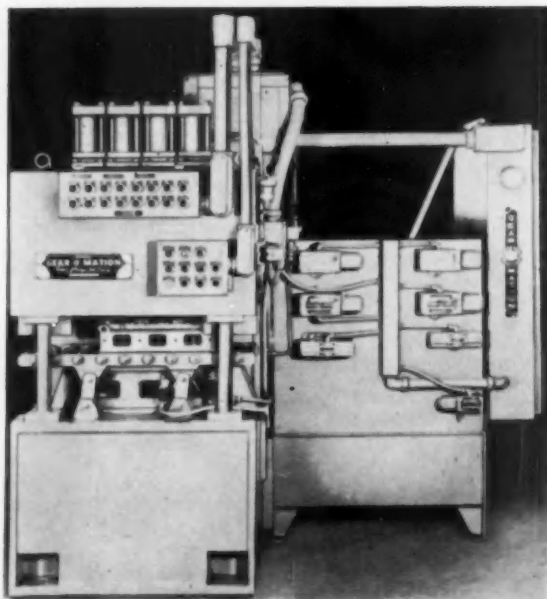
THE OM5 vertical Rigidmil designed for heavy cuts on large work pieces has longitudinal, transverse and vertical feed. It has a 50 hp vertical head mounted on a fixed column for maximum rigidity under heavy cuts. Saddle and table are also carried on a

fixed base.

A swinging pendant, adjustable to any operating position around the machine, provides quick pushbutton control for all machine functions. Sundstrand Machine Tool Co.

Circle 45 on postcard for more data

Automatic Machine Press Fits Valve Guides



This machine is designed to simultaneously press all valve-guide bushings into engine cylinder heads. Hydraulically operated and electrically controlled, the machine fits bushings at a predetermined force into any one of a family of five different Diesel engine cylinder heads. The heads are for two, three, and four cylinder engines of two types. In-line and V-type. Manually loaded and unloaded, the machine has a fully automatic work cycle. It weighs about 3000 lb and requires a floor space area of 3 by 6 ft. (Gear-O-Mation Div., Michigan Tool Co.)

Circle 46 on postcard for more data

Surface Grinder

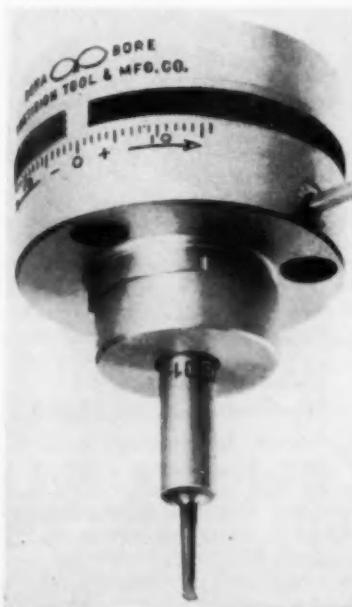
THIS Hydrail surface grinder has a work area of 48 by 36 by 240 in. and was designed to grind the ways of large machine tools. To meet the demand for the positive, fast and accurate vertical travel required, an unusual design in the form of anti-friction, recirculating ball nuts was incorporated in this machine. The use of these nuts reduces friction between nut and screw to a minimum; positions the rail without counterbalancing and extends the life of the screws. The Thompson Grinder Co.

Circle 47 on postcard for more data

Miniature Boring Head

THE A-1 miniature Deka-Bore boring head is a precision boring tool with an offset feature to compensate for tool grinds and measures only 2 1/4 in. in diameter by 1 15/16 in. long. Weight is 22 oz.

Able to hold quills up to 1/2 in. in diameter, it permits positive 0.0001 in. adjustments without backlash. It also has a calibrated micrometer screw that can offset the tool slide to compensate for tool grinds. Adjust-



Precision miniature Deka-Bore boring head

ments of up to 1/8 in. can be made on the diameter. It will fit any standard machine and will work vertically and horizontally. Precision Tool & Mfg. Co., of Illinois.

Circle 48 on postcard for more data

Abrasive Cutting Unit

ALMOST any ferrous or non-ferrous metal can be cut by a small, heavy-duty, high speed dry abrasive cutting machine made by Allison-Campbell Div., American Chain & Cable Co., Inc.

Designed for use in metal working shops, factories, mills, etc., the unit has the capacity to cut metals of practically all analyses up to 2 by 2 in. solids, 3 in. standard pipe, 3 by 3 in. angle iron and 4 in. channels. Cuts are made at the rate of 3 to 6 seconds per sq-in. of metal.

Circle 49 on postcard for more data

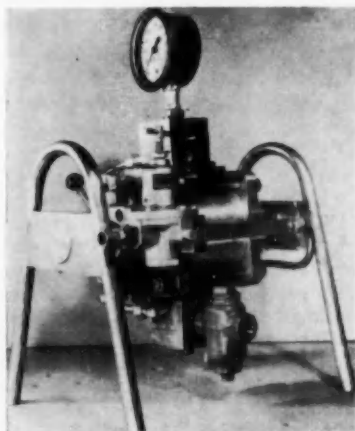
Honing Machine

NAMED the Model "AM," a tri-purpose honing machine has been designed for precision production runs, tool room work and salvage operations. It measures 48 in. high by 28 in. wide by 36 in. deep.

Speeds are variable from 250 to 1400 rpm. The drive, coolant tank and $\frac{1}{2}$ hp, 110 v, 60 cycle, single phase motor are completely enclosed in the heavy steel base which has a louvered cover to provide ventilation. Superior Hone Corp.

Circle 50 on postcard for more data

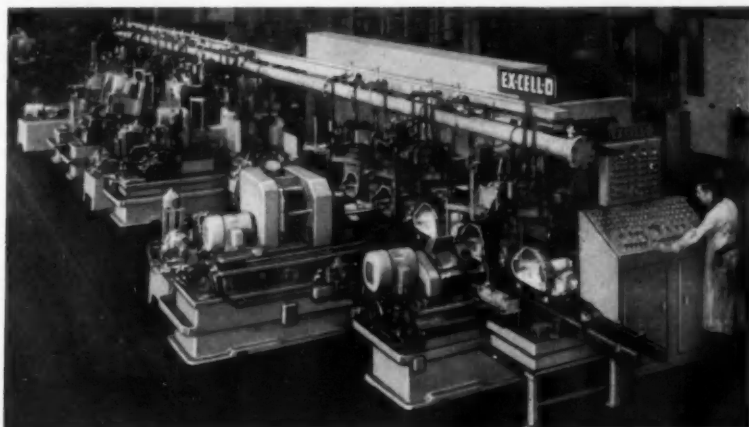
High Pressure Test Unit



This test unit is designed for high pressure hydrostatic test applications where maximum pressure must be maintained for extended periods. It will hold a preselected fluid pressure, within the 250 to 5000 psi range, for any required time. (Logemann Brothers Co.)

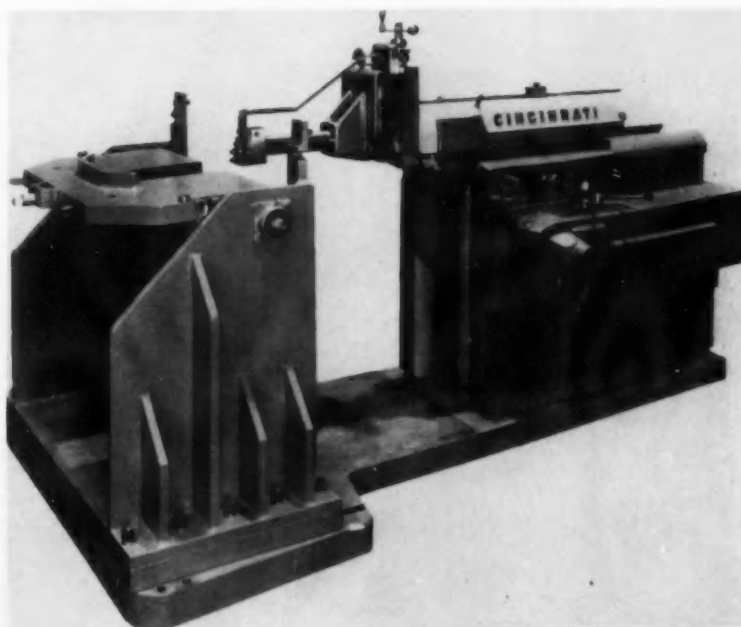
Circle 51 on postcard for more data

Transfer Machine Produces 125 Parts Per Hour



Twenty-four stations are included on this transfer machine for multi-diameter precision boring, facing, milling, air gaging, tapping and washing. The unit is designed for the transfer machining of aluminum transmission cases. (Ex-Cell-O Corp.)

Circle 52 on postcard for more data



Cincinnati 16 in. Rigid Shaper machines two surfaces at 90 degrees to each other

Shaper Equipped with Special Cross-Travel Head

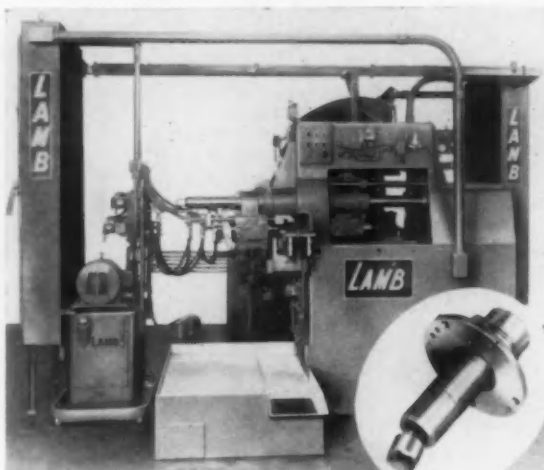
THIS special 16 in. shaper was designed to shape two surfaces, at 90 degrees to each other, in an irregularly shaped casting. The workpiece is held in a special two-station fixture mounted on the steel base. The fixture replaces the table and rail assembly normally furnished.

Because the workpiece is held stationary, the shaper is equipped with a special cross travel head that permits cross feeding of the tool. The extended tool holder includes an automatic tool lifter. The Cincinnati Shaper Co.

Circle 53 on postcard for more data

NEW PRODUCTION and PLANT EQUIPMENT

Automatic Assembly and Boring Machine



An automatic assembly and bore machine processes over 400 stator support assemblies per hour. Two parts are processed simultaneously. In an 18 second machine cycle, hopper fed bushings are pressed into parts which are then transferred to the precision boring station for machining to ± 0.0005 in. accuracy on diameter and 0.002 in. total indicator reading for squareness and concentricity. The machine is designed for possible integration into an automated transfer line. (F. Jos. Lamb Co.)

Circle 54 on postcard for more data

length and weighing from 50 to 52 lb.

Tank is eight feet long and two feet wide. Frame carrying the work-piece fixture is moved backwards and forwards by action of hydraulic ram. Roto-Finish Co.

Circle 55 on postcard for more data

Expanding Mandrel

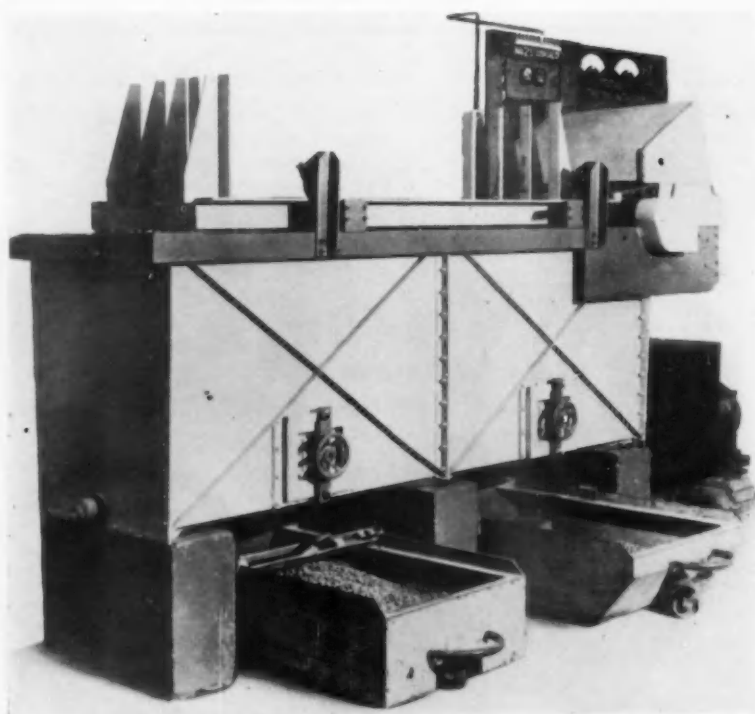
THIS Roll-Lock expanding mandrel is used for the assembly of speed reducers to insure that precision gearing standards are maintained. The fine tolerance required for the assembly is insured by the mandrel be-



Scully-Jones expanding mandrel

cause it is designed to provide a 0.0015 in. expansion above the high limit from a diameter which is 0.0015 in. below the low limit. Scully Jones and Co.

Circle 56 on postcard for more data



Roto-Finish "Roto-Ram" ram-type surface finishing machine assures uniform finish

Ram-Type Surface Finishing Machine for Large Parts

THE Roto-Ram surface finishing machine has been designed for handling large parts, such as spars and other units of high fineness-ratio. Its basic principle of operation is to allow the chip mass to remain stationary; the part to be finished is buried within the chip mass and relative motion be-

tween the two is achieved by applying a reciprocating action to the part.

Requirement that initiated the development of this machine was the need to reduce the amount of time spent on deburring and removing machining marks from high-tensile steel spar-booms approximately five feet in

Turret Depth Stop

THE Edlund turret depth stop helps to increase production whenever multiple drilling operations requiring different depths are to be performed on any one spindle.

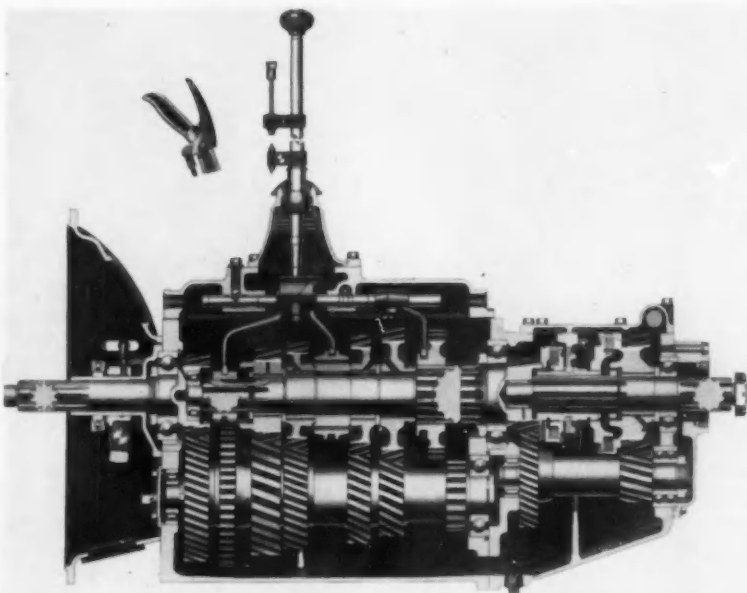
The stop is mounted to the front of the sliding arm and has four positions, each of which can be set for a predetermined depth. By manually rotating to its number position, each preset depth can be repeated accurately as many times as required. Two inches of depth screw adjustment are available in each position. Edlund Machinery Co.

Circle 57 on postcard for more data
(Turn to page 98, please)

NEW

PRODUCTS AUTOMOTIVE-AVIATION

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 73



Transmissions Feature 10 Forward, 2 Reverse Speeds

Two RoadRanger transmissions for engines up to 630 cu-in. of displacement and rated up to 185 hp, the R-63 and R-630-D (diesel ratios), feature 10 forward and 2 reverse speeds. All ratios are selected by one gear shift lever. The R-63 is a direct-in-tenth transmission and the R-630-D is a direct-in-ninth transmission with overdrive in tenth gear.

Basket Racks

Basket racks and wire baskets for space saving low-cost storage for employee clothing, tools, parts, equipment, etc. are available from Penco Metal Products Div. of Alan Wood Steel Co.

The racks are made of heavy gage steel in 73, 83 and 93 in. heights and 40 in. widths. They may be had in either single-face construction for mounting against walls or as double face units. They may be bolted end-to-end for any desired arrangement.

Two sizes of baskets are available,

Other features include: easy, quick shifts averaging 29 per cent between ratios; elimination of gear splitting through selective gear ratios that are evenly and progressively spaced and range shifts are pre-selected, automatic and synchronized. Also closely spaced steps permit engines to operate in maximum hp range. *Fuller Mfg. Co.*

Circle 60 on postcard for more data

measuring 9 or 12 in. wide by 13 in. deep by 8 in. high. A wire loop in the top frame of each basket corresponds to a hasp on the basket rack for padlocking.

Circle 61 on postcard for more data

Hard-Surfacing Electrode

Hard-surfacing electrode, Walmang No. 3, is a work hardening material that provides good wear and impact resistance. As deposited, the nickel-manganese alloy is extremely tough,

even at below zero temperatures. It is recommended for hard-surfacing manganese and carbon steel castings or forgings of all kinds.

The material deposits at approximately 229 BHN; it work hardens in service to as high as 555 BHN. *Wall Colmonoy Corp.*

Circle 62 on postcard for more data

Power Package

General Electric's Turbonator, a constant frequency power package, is described as the lightest power unit available to the aircraft industry. The 96 lb device consists of a 24,000 rpm axial turbine on a common shaft with a high-speed alternator, producing 40 kva at 400 cps.

Featured on the Turbonator is an air bearing in place of conventional oil or grease bearings and a self-cooling capacity which eliminates special cooling requirements at high ambients. Either ram or compressor bleed air can be used as the driving



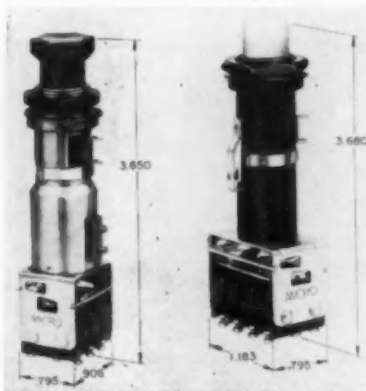
medium. The unit is capable of meeting industry requirements for flight speeds up to Mach 3.5. *General Electric Co.*

Circle 63 on postcard for more data

Lighted Pushbutton Switch

Two lighted pushbutton switches, an alternate-action unit and a magnetically-held unit, have been developed by Micro Switch.

The magnetically-held switch, designated 53PB8-T2, employs a small dc



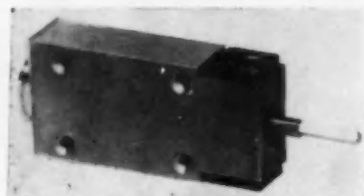
holding coil. When the button is depressed the switch remains actuated if its holding coil is energized. If the coil is not energized, the switch functions as an ordinary momentary pushbutton. The holding coil serves only to hold the switch in operated position until current is interrupted and does not pull the switch in, as in a relay.

The two-position alternate-action switch, designated 54PB67-T2, gives two types of indication, by button position and by use of the built-in indicator lamp. When the button of this switch is pushed it remains in the operated position, approximately $\frac{1}{4}$ in. below unoperated position. The next push returns the switch to the normal "up" position. *Micro Switch Div. of Minneapolis-Honeywell Regulator Co.*

Circle 64 on postcard for more data

Miniature DC Motors

The type VS miniature precision dc motor is a permanent magnet, ball bearing motor which measures only $\frac{7}{16}$ in. thick by $\frac{27}{32}$ in. wide by $\frac{1}{8}$ in. long. It is designed to meet the requirements of various MIL specifications on humidity, salt spray,



shock, vibration, etc. Weighing only 1.7 oz, it can produce starting torques up to 1 oz-in., and can be used in intermittent or continuous duty applications as required. *Globe Industries, Inc.*

Circle 65 on postcard for more data

Reverse Current Cleaner

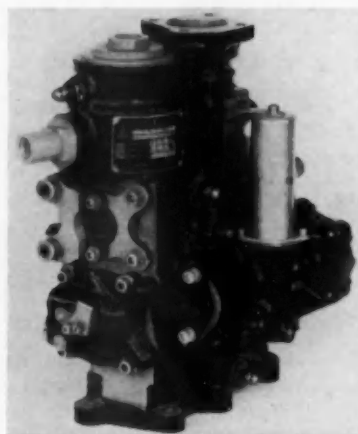
Oakite Composition No. 190 is particularly suited for cleaning heavily smutted steel. It also removes fingerprints, light surface rust and oxides resulting from spot or seam welding. The material is used at concentrations from 8 to 16 oz per gallon of water, at temperatures ranging from 180 to 200F, with reverse current, from 40 to 100 amps per sq-ft. *Oakite Products, Inc.*

Circle 66 on postcard for more data

Afterburner Fuel Control

The AR-9 afterburner fuel control was designed for turbo-jet engine operation where fuel requirements are as high as 35,000 lb per hour at ambient temperatures ranging from -65 to 300 F.

Weighing only 20 lb, the AR-9 is



a by-pass type control, capable of maintaining two per cent accuracy of fuel flow from sea level to 60,000 ft. *Chandler-Evans Co.*

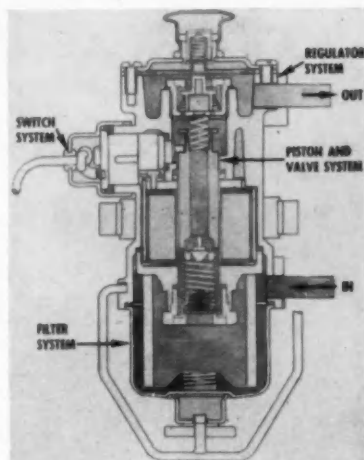
Circle 67 on postcard for more data

Electric Fuel Pump

This Stewart-Warner electric fuel pump, Model 240-A, is capable of pressures to 8 psi but, because its automatic pressure regulator is ad-

justable, pressure can be set to any desired level.

A large reservoir and efficient filter



element filters gasoline without impeding flow. Repair and complete overhaul can be accomplished by any qualified mechanic. Available in two models, 6 and 12 v, it fits any gasoline engine used for any purpose or on any vehicle. *Stewart-Warner Corp.*

Circle 68 on postcard for more data

Pressed Ceramic Parts

Pressed ceramic parts able to withstand extreme thermal changes, such as water quenching from 2200F, are available in production lots fabricated from a new material, ThermoShock HT-2 ceramic.

Applications include high temperature tooling such as copper brazing locators, projection and spot welding jigs, and sintering jigs. Also high temperature components such as electrical connector panels, missile and aircraft heat barrier parts and shielded arc welding nozzles. *Duramatic Products, Inc.*

Circle 69 on postcard for more data

Fork-Boom Attachment

Bulky non-palletized materials can be handled effectively by use of a combination fork and boom attachment which enables a standard fork lift truck to function as a crane truck. The basic boom attachment extends 30 in. and has a capacity of 4800 lb. *Automatic Transportation Co.*

Circle 70 on postcard for more data



**EVERY BORG & BECK CLUTCH
MUST "WALK A STRAIGHT LINE"
TO ASSURE PERFECT BALANCE**

Probably the most important single quality in a clutch is *balance*—because balance means smoothness of operation, not only of the clutch but of the engine as well.

That's why Borg & Beck clutches are checked for balance, at operational speeds, on specially designed test machines. Even the slightest unbalance is instantly detected and carefully corrected. Perfect balance is assured, as shown above, when the electric beam of the oscillograph is vertically straight on the calibrated screen. And every Borg & Beck clutch must "walk this straight line" before it passes inspection.

This is typical of the extra care that goes into every step in the making of Borg & Beck clutches. It is your assurance of top quality, top performance, top value.



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AIR BRIEFS



By R. RAYMOND KAY

Many Years of Planemaking Left Despite Stepped-Up Missile Program

Don't be misled by all the missile talk. Planemaking will remain the backbone of the aircraft industry for many years.

Naturally, the big talk and push will be on missiles. Stepped-up missile spending will help cushion the blow the aircraft industry received from last summer's pre-Sputnik defense cuts.

Despite the near-hypnotic missile trance, most experts agree that we'll have at least two more generations of manned aircraft. In fact, Lockheed Aircraft's President Courtlandt S. Gross offers this intriguing idea:

"... in a good many areas the missile ... will be the transitory vehicle, a transition between the manned atmosphere flying device and the manned space flying device."

Manned aircraft will be the biggest seller this year and next. The aircraft industry will ring up some \$11 billion to \$12 billion in sales for 1958. And it looks as if 1959's sales will be even higher. The Pentagon will pick up a \$7 billion tab for aircraft, engines, and related procurement. Another \$2 billion will go for research and development for aircraft, missiles, and space technology. Commercial business will make up the balance.

Aircraft manufacturers throughout the world have orders for some 950 airliners—piston, turbojet, and turboprop. By far, the bulk is with U. S. planemakers. They have commitments from American and foreign flag lines for 650 transports.

But don't be surprised to read soon about cutbacks or delivery-

date stretch-outs on some of these orders. The airlines are having a tough time getting the money to pay for them. The Civil Aeronautics Board financing policy is a tough one for the U. S. flag lines to crack.

No Special Skills Needed In Missile Program

Will new skills be needed in missilemaking? One of the nation's top experts doesn't think so. He's William M. Duke, director of the Titan missile program at Ramo-Woolridge Corp.

"Missile manufacturing does not call for truly new skills. We'll always need trained workers and technicians. Such men can adapt themselves to any new skills which the future may demand. As the production programs move along more attention may be given to exceptional plant cleanliness and worker reliability," Mr. Duke believes.

Small Businesses Eye Military Dollars

How to get more military work. That's a problem irking small businesses throughout the country. Why don't they go after direct military contracts? Here are their beefs:

- (1) There are too many competitors to justify the effort.
- (2) Bid preparation is too costly.
- (3) Bidding procedure is complicated.
- (4) They don't know how to get work they're qualified to do.
- (5) They don't get specifications soon enough to prepare bids.

These gripes came to light in a survey made by the Strategic In-

dustries Assn., Los Angeles. It polled 1000 independent firms throughout the nation doing defense work, largely as subcontractors.

Douglas DC-8 \$225 Million Investment

Douglas' DC-8 jetliner is now in the flight test phase of development. It took about three years and \$225 million to bring this new transport out. The company has orders from the world's airlines for 138 DC-8's worth \$700 million.

Douglas Aircraft says it now has an extended range DC-8 that will carry standard passenger loads non-stop 5600 mi at 600 mph.

But Chairman Donald W. Douglas believes that the DC-8 may be the last of its type. The next step, he says, may well be rocket- or nuclear-powered and fly at speeds 10 times as fast as the DC-8.

Manpower Requirements For Missile Making

Missile making takes fewer workers than planemaking. One engineer, for example, kept 10 production workers going on Convair's F-102 all-weather interceptor. But the company is figuring on only one production worker per engineer for its Atlas Intercontinental Ballistic Missile (ICBM).

Air Force Ballistic Missile Program Costs 3 Million Daily

The nation's ballistic missile program is "on schedule." That's the word from Major General William T. Thurman, deputy director, procurement and production, Air Materiel Command, Akron, Ohio. But

(Turn to page 106, please)

MEMO
 Tom: You ask why
SPIROLOX
 Retaining Rings?
 well—
 Here are just a few reasons

No groove "pop out" problems here, Tom. That SPIROLOX is in there to stay!

Tom note:
 Full circle
 (360°) retaining
 surface!

Reusable, too!
 No loss of
 circularity
 or holding
 power.
 Think of the
 savings!

This ring eliminated
 failures, solved our
 service problems;
 and saved us
 assembly
 time!

PISTON PIN
 RETAINER
 (Internal use example)

Know how I put
 that ring in? With
 a screwdriver! Know
 how I can get it out?
 With a screwdriver!
 No special tools with
 SPIROLOX, Tom — easy
 in, easy out!

See? Automatically locks
 itself in the groove under
 thrust. Can't wind or unwind!

Here's a retaining job for
 you! Resists thrust up to
 its own shear strength!

—And how's THIS for
 a uniform shoulder?
 Uniform ring height, too!

ROLL-LOCK
 CHUCKING TOOL
 (External use example)

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 FOR ENGINEERING TEST**

Spirolox has proven the solution for hundreds of manufacturers. Test samples may give you the answer to your problems — or demonstrate there is a better way. Test samples of CircOlox, Ramco's newest development in retaining rings are also available. Send us blueprints or sizes needed for tests — and we'll gladly send samples of both types, plus Data Bulletins. Write Ramsey Corporation, subsidiary of Thompson Products, Inc., Dept. H, St. Louis 8, Missouri.



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O-367R

AUTOMOTIVE INDUSTRIES, July 15, 1958

87

The BUSINESS PULSE

Consumer Purchases of Nondurables and Services Rose During the Second Quarter, While Sales of Durables, Including Automobiles, Leveled Off. More Activity in Construction and Public Projects.

It seems quite possible that the second quarter of 1958 will go down in the annals as the low point of the current business cycle. The record for the period is still not complete, but what is known is decidedly favorable on balance, in the sense that it suggests a definite transition from decline to stability.

Upturn in Production

For manufacturers, the second quarter witnessed a cessation of the fall in new orders and considerable further progress toward inventory balance. One tangible result of this improvement was the upturn in May and June in the index of industrial production, after eight consecutive months of decline. It also apparently reduced to mere attrition the previous sharp reduction in factory employment.

The second quarter likewise saw an important change in the area of construction activities. Housing felt the dual stimulus of liberalized Government-mortgage programs and easy money, and in May starts on new non-farm dwellings climbed back to the one-million mark at a seasonally adjusted annual rate. This was sharply above the recession low of 880,000 units recorded in March. Moreover, foreshadowing data (applications for FHA commitments, VA approval requests, and contract awards) also increased substantially, indicating that activity may well rise further during the summer months. At the same time, the spring period brought a high total of contract awards for public projects, including highways, which further enhances prospects for strength in the construction sector as the year progresses.

This Survey, published for the readers of automotive magazines exclusively in **AUTOMOTIVE INDUSTRIES**, has been prepared by the Guaranty Trust Company of New York

Purchases of Nondurables Advance

Most reassuring of all, as far as the second quarter was concerned, was the firm tone of consumer buying. Retail purchases of durables, including automobiles, leveled out during the period, in contrast to their marked pattern of decline during the preceding half year. At the same time, consumer purchases of nondurables and services advanced. As a result, the personal-consumption component of the gross national product will probably show a small rise for the period when it becomes available.

With these improvements in manufacturing, construction, and retail trade, it is clear that legitimate grounds exist for at least moderate optimism as the second half gets under way, particularly since it is probable that increased Governmental spending (Federal, State, and local) will give the economy an additional nudge as the year progresses.

What is perhaps more important and more gratifying than anything else is that the really critical phase of the business adjustment appears to be in the past rather than the future. Actually, this most critical phase probably occurred fairly early in the year when business

statistics were very bleak and when there were few, if any, hints that a bottom might be close at hand. The danger then was that general sentiment might be undermined and that concern would give way to alarm.

Had that happened, purchases of all types might have been slowed, causing the recession to feed upon itself.

Higher Stock Averages

The record of the second quarter strongly suggests, however, that such danger has now been averted. Sentiment did not deteriorate when the statistics were worst but instead firmed up, and the improvement was sufficient to affect market transactions in key areas in a positive way. This can be seen from the movement of stock averages, which tended quite persistently higher throughout the second quarter. It is also attested to by the gratifying record of personal consumption expenditures.

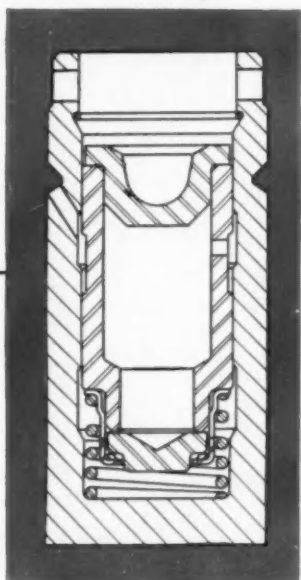
Since sentiment managed to withstand the barrage of bad business news early in the year, the danger of deterioration now would not seem very great, inasmuch as business statistics have meanwhile improved. This is one of several reasons for believing that present stability is not a false bottom but rather represents a firm recession low that will eventually give way.

While most recent developments have been of an encouraging nature, there is one major exception, namely, the trend of capital spending. The latest quarterly survey of investment intentions conducted by the Government not only confirms

(Turn to page 103, please)

Designing valve gear?

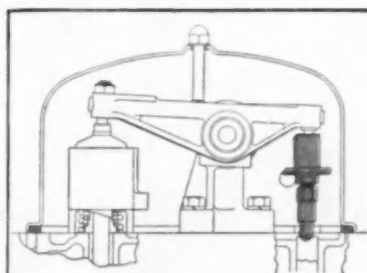
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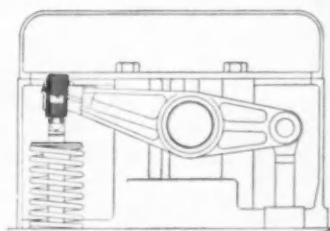
CHICAGO SPRING-LOADED FLAT
VALVE HYDRAULIC TAPPET



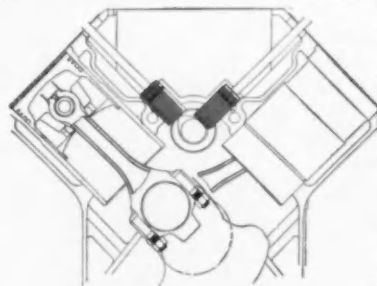
INSERT TYPE ROCKER
ARM UNIT



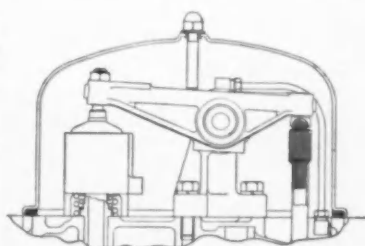
PUSH ROD TYPE FOR COMPRES-
SION RELEASE APPLICATION



THREADED TYPE ROCKER
ARM UNIT



V-8 AUTOMOTIVE HYDRAULIC
TAPPET APPLICATION



HYDRAULIC UNIT ON
END OF PUSH ROD

Design

of complete valve gear installations for any type of engine . . . passenger car, truck, tractor, diesel, aircraft or industrial.

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CHICAGO's facilities insure precision-manufacturing, scientific testing and rugged, trouble-free performance in every tappet. We welcome the opportunity to serve you.

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• • INDUSTRY STATISTICS • •

WEEKLY U. S. MOTOR VEHICLE PRODUCTION

As reported by the Automobile Manufacturers Association

Make	Weeks Ending		Year to Date	
	June 29	June 21	1956	1957
PASSENGER CAR PRODUCTION				
Rambler	4,368	4,117	91,961	55,537
Total—American Motors	4,368	4,117	91,961	55,537
Chrysler	1,595	1,267	29,947	72,442
De Soto	1,613	504	19,539	72,670
Dodge	3,379	3,394	55,453	170,748
Imperial	255	194	7,563	24,378
Plymouth	9,002	9,399	201,715	380,727
Total—Chrysler Corp.	15,944	14,758	314,217	721,162
Edsel	197	135	6,944	
Ford	22,144	17,195	501,598	819,861
Lincoln	271	336	14,792	23,945
Mercury	3,436	1,753	64,262	171,484
Total—Ford Motor Company	26,048	19,419	587,594	1,015,310
Buick	3,852	4,296	133,085	238,973
Cadillac	3,220	3,223	77,051	85,032
Chevrolet	27,522	27,997	719,391	792,004
Oldsmobile	7,282	5,479	179,388	225,642
Pontiac	2,894	3,926	120,185	198,672
Total—General Motors Corp.	44,900	44,931	1,220,106	1,543,323
Packard	46	52	1,503	4,573
Studebaker	1,070	1,120	17,973	31,116
Total—Studebaker-Packard Corp.	1,116	1,172	19,476	35,689
Checker Cab	60	12	1,916	2,315
Total—Passenger Cars	82,336	84,409	2,235,262	3,373,336
TRUCK AND BUS PRODUCTION				
Chevrolet	5,653	5,935	149,138	187,161
G. M. C.	1,310	1,074	31,694	35,454
Diamond T	119	152	2,792	2,512
Divco	60	48	1,440	1,795
Dodge and Fargo	1,491	1,373	30,098	41,532
Ford	4,834	4,166	115,487	185,108
F. W. D.	10	23	601	595
International	1,526	1,540	48,670	58,980
Mack	315	296	7,467	5,796
Studebaker	228	260	5,748	6,425
White	335	335	8,851	10,299
Willys	864	1,879	40,764	38,700
Other Trucks	60	60	1,575	2,295
Total—Trucks	16,813	17,139	444,395	570,630
Buses	10	35	1,646	2,316
Total—Motor Vehicles	109,159	101,583	2,681,303	3,955,282

1958 TRUCK TRAILER SHIPMENTS

Industry Division, Bureau of the Census

Type of Trailer	Four Months		
	April	1956	1957
Vans			
Insulated and refrigerated	306	1,064	1,546
Steel	46	141	238
Aluminum	260	923	1,308
Semi-insulated	26	165	298
Steel			45
Aluminum	26	185	244
Furniture	199	574	706
Steel	199	574	637
Aluminum			69
All other closed-top	1,107	4,770	6,953
Steel	320	1,687	3,482
Aluminum	787	3,083	3,501
Open-top	82	547	1,199
Steel	62	299	643
Aluminum	30	258	556
Total—Vans	1,730	7,120	10,723
Tanks			
Non-and low pressure			
Petroleum			
Carbon and alloy steel	201	800	
Stainless steel	22	85	
Aluminum	117	417	
Total—Petroleum	340	1,302	1,702
Chemical, feed, fluid solids	85	266	
All other, incl. aircraft refuelers	38	68	
High pressure (LPG, chemicals, etc.)	22	105	
Total—Tanks	465	1,741	2,234
Pole, pipe and logging			
Single axle	29	107	149
Tandem axle	45	142	245
Total	74	249	394
Platforms			
Racks, livestock and stake	120	505	648
Grain bodies, all types	82	260	589
Platforms (Rats), all types	421	1,551	2,464
Total—Platforms	623	2,319	3,699
Low-bed heavy haulers	244	735	1,135
Dump trailers	242	604	744
All other trailers	172	586	1,126
Total—Complete Trailers	3,550	13,354	20,055
Trailer chassis ¹	245	1,013	1,057
Total—Trailers and Chassis	3,795	14,367	21,112

¹ Sold Separately.

REGIONAL SALES OF NEW PASSENGER CARS

Zone	Region	May			Five Months		Per Cent Change		
		1956	1957	1958	1956	1957	May over April	May over May 1957	1958 over 1957
1	New England	26,411	27,587	32,645	106,993	133,565	- 4.26	-19.10	-19.89
2	Middle Atlantic	84,345	84,946	112,509	373,682	482,250	- .71	-25.03	-22.51
3	South Atlantic	60,002	46,253	74,054	254,913	331,245	+29.73	-18.98	-23.04
4	East North Central	98,557	102,299	140,462	480,187	646,857	- 3.95	-29.83	-28.86
5	East South Central	16,339	17,055	26,272	66,815	124,750	- 4.20	-37.61	-30.41
6	West North Central	43,340	44,915	45,508	192,393	224,140	- 3.51	- 4.70	-14.16
7	West South Central	34,268	32,544	50,361	181,540	234,670	+ 5.29	-31.96	-22.64
8	Mountain	14,605	14,970	18,236	71,804	80,907	- 2.44	-19.91	-11.25
9	Pacific	48,619	47,888	56,277	229,425	295,448	- 4.33	-18.94	-22.35
Total—United States		423,484	419,255	556,324	1,957,752	2,553,632	+ 1.25	-23.88	-23.34

States comprising the various regions are: Zone 1—Conn., Me., Mass., N. H., R. I., Vt. Zone 2—N. J., N. Y., Pa. Zone 3—Del., D. C., Fla., Ga., Md., N. C., S. C., Va., W. Va. Zone 4—Ill., Ind., Mich., Ohio, Wis. Zone 5—Ala., Ky., Miss., Tenn. Zone 6—Iowa, Kan.,

Minn., Mo., Neb., N. D., S. D. Zone 7—Ark., La., Okla., Tex. Zone 8—Ariz., Colo., Ida., Mont., Nev., N. M., Utah, Wyo. Zone 9—Cal., Ore., Wash.

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stepped-up
competition
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- won't chip, won't rust, won't peel
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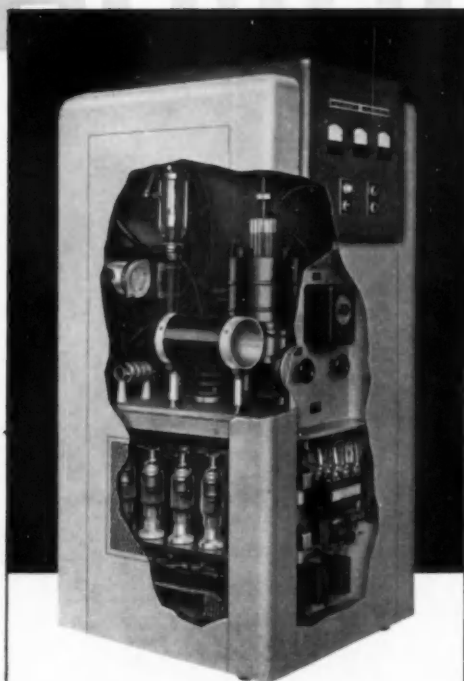
A-C engineering includes help in planning the most efficient use of induction heating in your operation, the design and manufacture of work fixtures and handling equipment, the testing of your material samples in A-C's modern laboratory. When your heater is installed, a field engineer from one of the A-C regional offices near you supervises the job.

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1. Water-cooled oscillator tube has life expectancy of 5000 hours or more — with ample reserve capacity for emergencies.
2. Plate transformer is designed for continuous, heavy-duty service... has large reserve capacity.
3. Six-tube, three-phase full-wave rectifier section is standard... choke coil and capacitor network protect rectifier tubes from high-frequency currents.
4. Compact, attractive all-steel cabinet provides electrostatic and electromagnetic shielding.
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7. All operating controls are clearly marked and mounted on one panel.
8. Safety features: heavy-duty control, high water temperature switch, high and low water pressure switches, fuses, interlocked doors.

And... Bakelite standoffs, adequate clearances, clean wiring arrangements, ceramic coils, heavy duty relays.

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Universal Joints . . .**

when highest quality
is absolutely essential





Spicer Universal Joints . . . for 30,000 Applications

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You'll find Spicer joints on all kinds of aircraft—where there can be no compromise with quality.

Where Dynamic Balance Is Critical

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Where Toughness Is Essential

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Adaptable To Your Power Transmission Needs

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Many of these products manufactured in Canada by Hayes Steel Products Limited, Markham, Ontario



News of the MACHINERY INDUSTRIES

(Continued from page 76)

plumb worn out." The speaker stated that "again, if funds are available from more profitable years, this replacement can best be made in a year of low-volume requirements, such as the one we are now experiencing." He added that obviously when a machine is worn out, management should be informed and a replacement plan developed—and that the many technological developments of the past year will help in stating the case to management.

Mr. Butterfield summed up this phase by saying "it would seem that a great many machines will become obsolete in the nation this year." And that "to the machine tool industry, this means opportunity to make sales of new machines."

Technological Advances

In commenting on obsolescence as affected by technological improvements, he expressed the opinion that 1957 was outstanding from the standpoint of introduction of new developments. Advancements in techniques of tape-controlled machinery were particularly complimented. Mention was made of a new concept in in-line transfer machines which provides for machining three different intake manifolds on the same machine and thus increases machine adaptability. He thought this concept might be expanded further. References were also made to a modular-type stamping press, moving-bolster presses, and a continuous transfer-type grinder as other valuable contributions during 1957.

Mr. Butterfield, however, cautioned users against several "pitfalls." He said, "Don't be fast-led into a new and fancy machine. Instead, demand that the machinery salesman prove—and then have your financial people confirm—that the new machines will make you money over and above what you now have." He also cautioned against over-doing automation. "It is better by far," he declared, "that

we make our strides in automation a bit slower but more surely."

The second speaker who discussed machine tool obsolescence was Marvin J. Barloon, professor of economics, Western Reserve University. His talk was entitled "The Opportunity of Obsolescence."

Equipment Aging

Mr. Barloon called attention to the "aging population of machines" throughout U. S. industry in quoting the following statistics: In 1945, about 38 per cent of all metal-working equipment was over 10 years of age. In 1953, 55 per cent was over 10 years old and 19 per cent over 20 years old. Current figures are in process of compilation, but he predicted the present stock of machines in American industry "is at least as old as it was in 1953, and quite probably older."

He did point out the faster-growing industries of our country, such as automobile, steel, and electric utility, are stocked with more modern equipment. But commented, "for the most part, this is because our industries have been growing" so fast.

Why Replace?

He expressed the belief that "in the thinking of many American industrial managers there is a strong bias in favor of keeping in service any machine . . . which will do the job. When you place before an industrial executive a proposal to replace an outmoded machine with a new model, what does he look at hardest? He looks at the high cost of the new model. In figuring a pay-off period he makes it short. He challenges the builder's salesman to prove that he ought to make the replacement. In concentrating on the cost of the replacement he ignores the cost of not replacing."

There has also been, he indicated, a wide divergence of opinion of what the annual pay-off should be. A survey made several years ago showed that 14 per cent of the



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firms inquired would be satisfied with a return of 15 per cent or less, while 17 per cent wanted 50 per cent or more. Some said they would be willing to replace for a return as low as 10 per cent; but others would not replace for a return of less than 100 per cent.

Mr. Barloon continued, "Fortunately, inroads are being made in the old habits of thought which have retarded modernization for so long. For this, we owe a great deal to the work of Dr. George Terborgh

of the Machinery and Allied Products Institute (MAPI) The MAPI formula is a rational dollars-and-cents investment calculation—balancing the dollars the proposed machine will cost against the dollars it will save. . . ."

Replacement An Investment

"Another good method is the one which treats the replacement as an investment. Suppose, for example,

a proposed replacement would cost \$10,000 and would have a service life of 10 years. Suppose, also, that it will save an estimated \$3000 a year in operating costs. To get our \$10,000 back over 10 years, we will have to regard \$1000 of the operating savings as a return of capital. This leaves \$2000 as income—a 20 per cent return on the investment. . . . The machine is an investment—just as truly as a Government bond is—and it should be accepted or rejected strictly on the income it promises to yield."

Indirect Benefits

"We bias our thinking against replacement in still another way. We look for the benefits of a replacement . . . only at the work station where the new machine would be operated. But, quite frequently, major (cost reduction and other important) benefits may accrue in other production departments, in finished stock, in shipping, or in the field of service."

New Methods

"But, we should go even farther than this. . . . Sometimes the machine may be the very latest model, and still it ought to be replaced." Newer process developments, such as "flame-cutting, powder metallurgy, extrusion, and precision casting." . . . "might call for a machine replacement not so much because the old machine is obsolete, but because the process it performs is no longer the best way to do the job."

Investment Salesmen

"So much of American industry is out of date because corporate executives have not yet brought the full power of financial thinking into the production department. When a machine builder's representative comes around, he is sometimes treated as a peddler, as an intruder. . . . But, if the salesman is any good, he is not an intruder nor a peddler. He has dollars for sale. He is an investment salesman. The executive who throws blocks in the way of a machine builder's salesman is actually defying the man to show him a way to make more money."

"But we are moving from the



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Exceptional performance and dependability are standard with Lamb Electric Motors, at no increase in cost, because they are "custom tailored" by personnel having many years of experience in this field.

May we demonstrate these advantages for *your* new and redesigned products?

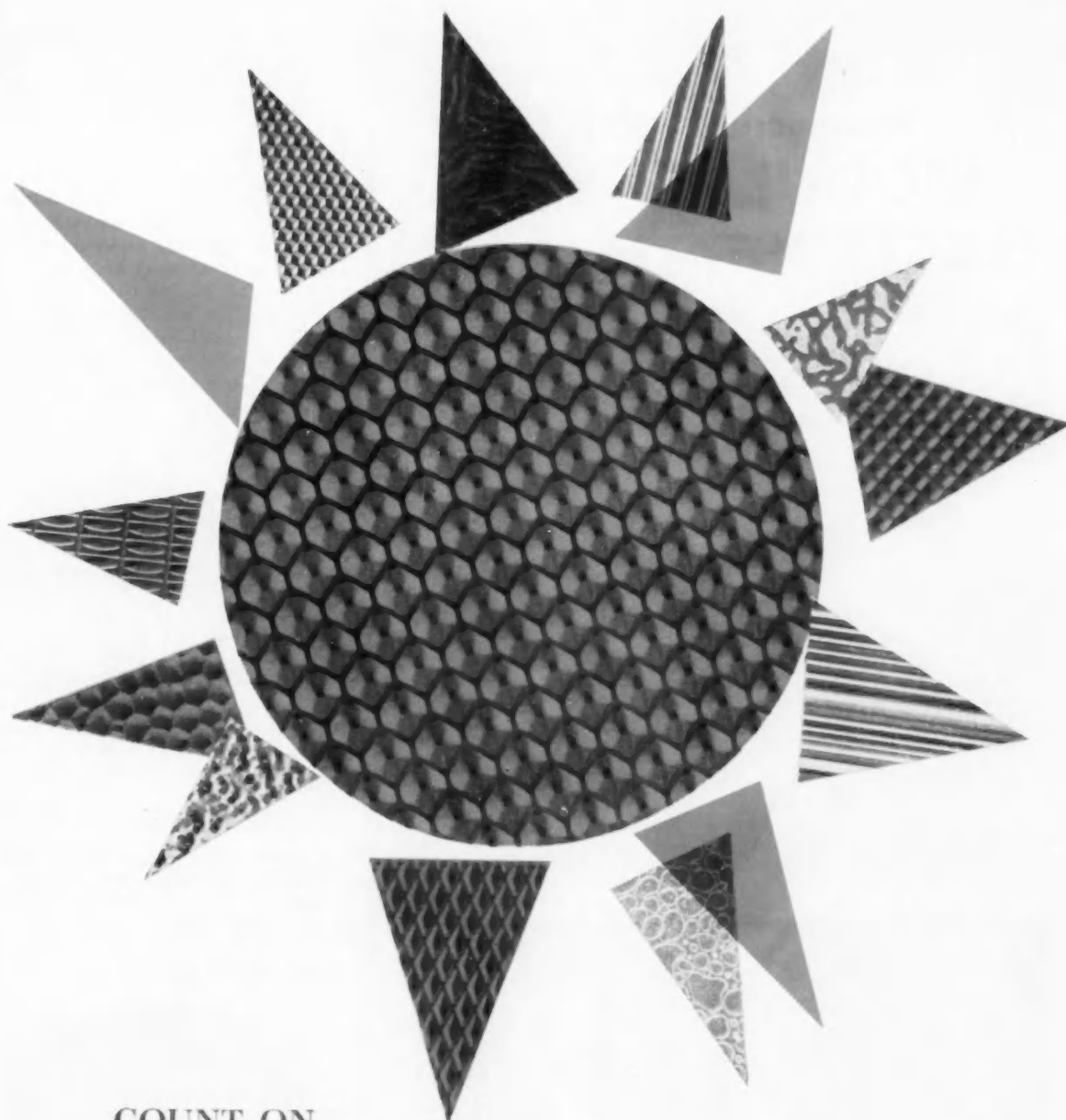
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Whether you need big trim, small trim, or a lot of both—you need Firestone Fashionized Aluminum. You need the kind of equipment and experience that only Firestone and its streamlined new facilities can offer: the all-inclusive press sizes and capacities, the automatic transfer equip-

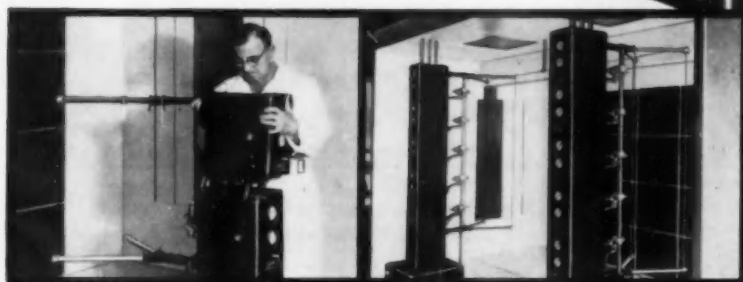
ment and high-speed conveyors, the anodizing line that delivers 5,000 square feet of colored brightwork an hour—in part sizes up to seven feet long! In short, you should look into Fashionized Aluminum and Firestone's 50 years of experience in metal fabrication and finishing. Write, phone or wire today.

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All the facts in Bulletin E-1. Learn how this system can save you time, money and materials *plus* many unique installation, operation and maintenance features. Contact your nearest Binks Branch Office, Binks representative or distributor, or write direct.



Stack modular units as needed for vertical coverage.

For higher production demands, units are installed side by side.

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era of the tough buyer. Under the more rational calculation of replacement questions sparked by the MAPI studies, we may well be on the threshold of a revolution in replacement policy. . . . Various trade associations—notably the National Machine Tool Builders' Association—have carried the movement forward. A large and growing number of machine builders have come to realize that rational calculation will sell more new machines than inspirational drum beating. Leading metalworking firms in a wide variety of industries are adopting a continuing and well conceived replacement policy."

New Production and Plant Equipment

(Continued from page 82)

Electronic Tachometers

HIGH-ACCURACY tachometers, called the PT series, measure speed electronically. They were designed to measure rotational speeds of electrical, hydraulic and pneumatic power systems and internal combustion engines.

Inputs to the tachometers are electrical pulses. Any repeating pulse with a known relationship to the speed being measured can be used.

Available in portable cases or for surface mounting, these instruments



Performance electronic tachometer

feature one per cent of full scale accuracy with ± 20 per cent variation in power supply voltage over a wide temperature range. Power input can be 6 v dc, 12 v dc, or 115 v ac. Performance Measurements Co.

Circle 59 on postcard for more data



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TYPICAL PROPERTIES OF SELF-LUBRICATING BRONZE OILITE BEARINGS †

Porosity, %	18-23
Ultimate Tensile Strength, (psi)	18,000
Compressive Strength (psi)	20,000
Elongation, % min. in 1"	10
Brinell Hardness	40

† Other materials and physical properties available.

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the most trusted name in powder metallurgy



AMPLEX DIVISION

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SELF-LUBRICATING BEARINGS • PRECISION PARTS • METAL FILTERS • FRICTION UNITS

Powder Metallurgy in the USSR

(Continued from page 59)

and etched surface facing optics and camera above it. The use of a reflecting mirror lense assures maximum working surface.

Powder Metallurgy of Beryllium

A Major effort is apparently being conducted in this field at the Kalinin Institute. Powder metal-

lurgy is held to be the ideal technique to produce sheet of satisfactory engineering ductility. The effects of grain orientation and committant embrittlement in the transverse and perpendicular directions to that of rolling can be considerably reduced by careful manipulation.

I was shown several pieces of

sheet that had been produced in the laboratory. They were from 2 to 6 ft long, from 2 to 8 in. wide, and were of two thicknesses, about 0.010 in. and 0.040 in. (0.25 and 1 mm).

Beryllium fluoride is reduced with magnesium. The resulting granules, 2-3 in. in size, are comminuted by machining and ball milling under argon to 40 micron average particle size. The powder is hydrostatically pressed at about 45-65 tsi (6000-9000 atm.) and vacuum sintered at 1200 C, the vacuum being at least 10^{-5} mm. Forging and hot rolling are done while heating the metal in air. Although no accurate statement of the physical properties were given, it was stated that the BeO content of the powder before pressing is considerably less than one per cent.

Powder Metallurgy of Titanium

One of the most interesting developments observed in the Soviet Union in the field of powder metallurgy was undoubtedly their work on titanium. Some of the most impressive samples on display included the following:

Ti-alloy ingot, composition 4 per cent V, 2 per cent Al. Size 6 in. in diameter, 15 in. high. Hydrostatically pressed at about 60 tsi, sintered in 10^{-5} vacuum at 1400 C to density of 4.41, weight 22.3 kg.

Ti-alloy ingot, composition 9 per cent Sn. No details could be obtained, except that the size was approximately the same as that of the Ti-V-Al ingot. Under (1).

Ti-Alloy sheet, composition not given. Size 2 meter in length, meter width, 3 mm thickness. A hydrostatically pressed and vacuum sintered ingot is reheated in argon, free hammer forged at 1000 C into slab, hot rolled at 1000 C, finally cold rolled. Final density is 4.5.

Ti-alloy compressor blades, composition not obtained. Pressed hydrostatically into preshapes, vacuum sintered in tungsten resistor furnace at 1400 C, hot die forged after heating in argon. Flash is removed by shearing. Size is approximately 8 by 2 3/4 in. with heavy root section on one end, slight knob-like center protrusion on the other end.

My Russian hosts indicated that

ROCKFORD



CLUTCHES Are Adapted for Use with High-Speed Engines

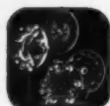
Because modern construction methods require faster and faster delivery hauls with more and more cycles per hour, high speed engines are a must. The centrifugal force they develop presented a clutch problem—until ROCKFORD CLUTCHES were designed to minimize the effect of their multiplied degree of centrifugal force. If you want your heavy-duty machines to stay more hours ON THE JOB with less time IN THE SHOP—for adjustments and repairs—it will pay you to investigate the more torque grip, longer work life, and better heat disposal provided by ROCKFORD CLUTCHES.

SEND FOR THIS HANDY BULLETIN
Gives dimensions, capacity tables and complete specifications. Suggests typical applications.

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CLUTCHES



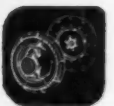
Small
Spring Loaded



Heavy Duty
Spring Loaded



Oil or Dry
Multiple Disc



Heavy Duty
Over Center

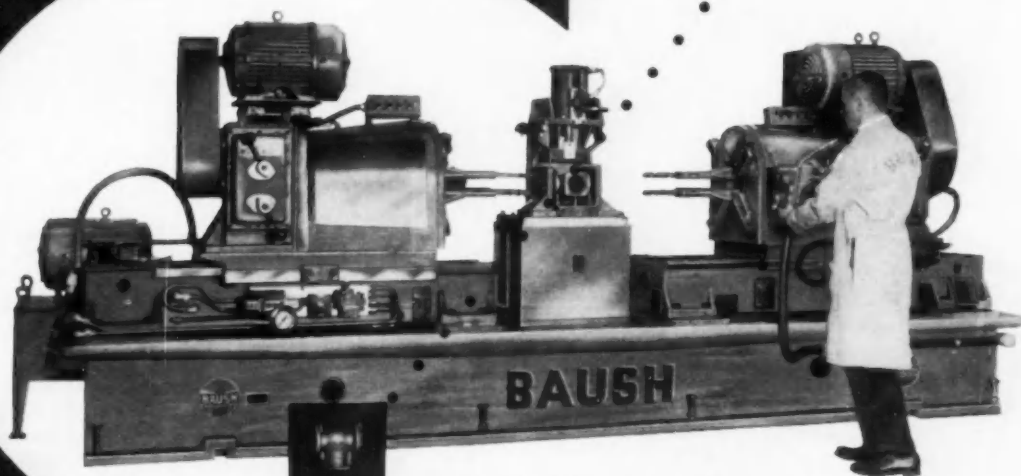


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Stainless Steel Gate Valve
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SPECIFICATIONS:

Machine has drilled steel base with cast-in steel reinforcement — integral slides with hydraulic ram — and hydraulic ram, pump and motor mounted on the base.

Base has hardened cast-iron base. Two 14" dia. round ways have 4 spindles each with variable arms. Heads have four 10 speed shifts and hand lever gear box, as well as special support plate to support spindles and provide individual manual adjustment in and out in a straight line for four 14 equally spaced bolt circle holes.

Holding fixture and bushings guide drills and all electrical controls are J.I.C. Standard, arranged for jogging.

Whether it is a 36 station transfer, an 8 station rotary, or a unit such as this one illustrated — YOU CAN DEPEND ON BAUSH TO DESIGN AND BUILD THE BEST.



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What do you want in a 22 ton O.B.I.?

Dependability, quiet operation, rigidity, accuracy, a trouble-free transmission and drive?

All these features and more have been incorporated into Clearing's new Torc-Pac 22 ton O.B.I.

The Torc-Pac 22 is compact, readily portable, complete with all necessary controls—ready to operate when you receive it. And it has a high performance, wet disc air-friction clutch and brake all wrapped up in a sealed-in-oil drive. Read more about it on the next page.

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they may be using two methods of producing powders for the alloys: (1) the blending of the elemental powders, and (2) the co-reduction of the mixed oxides. The first method appeared to be based on the use of either Ti-hydride powder or powder produced by Electrolysis. Method two involves mixtures of TiO_2 , Al_2O_3 and V_2O_5 with CaH_2 used as reducing agent. The quality of the resulting product is so high, that the expense of using calcium hydride for the reduction process is warranted. The lime residue was said to be readily removable from the powder by simple hot water washing technique and any trace impurities are removed relatively easily during vacuum sintering.

The properties of titanium powder metallurgy products as given to me are reproduced in accompanying table. It is noteworthy that the analysis of sintered and forged titanium ingots was given as 0.015 per cent H, 0.05 per cent N, 0.15 per cent O.

When I inquired about impact resistance, a figure of 10 ft-lb for notched, forged Charpy bars was given; the figure was about 20 for sheet. Potential applications were suggested as corrosion resistant parts and tank linings in chemical construction, parts for navigational instruments, pump components, and compressor, steam engine and turbine parts.

The foregoing article is an abstract of a paper presented by the author at the 1958 Powder Metallurgy Show and Meeting held in Philadelphia.

Coated Abrasive Machinery Show

(Continued from page 63)

ating and/or oscillating action.

Many smaller tools were also in evidence at the show. Rotor Tool Co. showed vertical and right-angle disk sanders and grinders having speeds up to 20,000 rpm, and air-operated tools for grinding and deburring with abrasive and other special points. Black & Decker Mfg. Co. exhibited a com-

plete line of electric pad, disk and belt portable sanders. National-Detroit, Inc., featured a "dual-action" air sander for both roughing and finishing operations.

The foregoing machines are representative of the wide variety of abrasive-cutting equipment, both large and relatively small, contained in the exhibits. Some of these, as well as others, are pictured in the accompanying illustrations. In addition, there were displays of wheels, exhaust systems, filters, cutting oils, dust collectors, etc.

BUSINESS PULSE

(Continued from page 88)

the probability of continuing decline in this sector throughout 1958 but indicates as well that businessmen have been scaling down programs since the previous survey was taken. Businessmen now expect to spend a total of \$30.8 billion on capital projects this year, 17 per cent less than the record outlays in 1957. In the survey reported a quarter earlier the anticipated decline from 1957 was 13 per cent.

Decline in Capital Spending

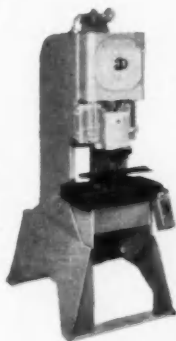
This is a substantial setback and, if actually realized, will be the most severe of the postwar period. It means that recovery forces, if they are to make early progress, will have a significant drag to overcome. It is primarily because of this outlook for capital spending that so many observers lean to the view that recovery will be relatively slow in its early phase. Indeed, some analysts think that the decline in capital spending will prevent near-term recovery and believe instead that the economy may experience a "long bottom." This, however, may be too extreme a view, particularly since vigorous recovery got under way after the 1954 recession before the decline in capital spending was arrested.

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Production Control Equipment Saves Time at Parts Makers Plant

Due to last minute changes in the makeup of the June 1 issue of AUTOMOTIVE INDUSTRIES, this editorial material was accidentally omitted. It completes the article with the above title, published on pages 70 and 71.

Each foreman carries a light-

weight telephone handset attached to his belt. He plugs this into the jack on the control box at the work station and calls the dispatcher. The dispatcher then calls the parts man over the plant paging system and tells him where the material is

needed. This feature of the system alone cuts downtime for material shortage or pile-up over 75 per cent, according to the company.

One of the major headaches of production management has been the downtime involved in equipment breakdown.

Since installing the Telecontrol equipment, whenever a machine breakdown occurs, the operator flips the toggle switch on his control box and a foreman arrives in seconds. The foreman transfers the operator from productive time to downtime by inserting his key in the lock switch on the box. This changes the warning flash of the red light to a steady red signal, both at the box and on the information center's display panel. There is also a warning beep signal in the information center to insure the dispatcher will notice the steady red light.

The foreman then telephones the dispatcher and asks for repair assistance. The dispatcher calls over the paging system and directs the repair or set-up man to the machine. Within moments, the operator has been transferred to downtime, and the repair man is on his way. If the trouble can be fixed right away, the operator will wait to resume production on the same machine. The foreman can then leave the station. To resume production, the operator pushes the reset button on the control box and the green light switches on. At the same time, the productive time counter on the display panel starts registering again.

However, if the stoppage is more serious, the foreman tells the dispatcher that the machine is out of production and asks about transferring the operator to another work station. The dispatcher moves the operator's numbered activating plug to the display panel of a machine that is set up and ready for production.

Cutting Production Costs

With the Telecontrol equipment, Hancock has reduced work stoppages from breakdown to a minimum, and estimates the equipment has jumped actual production time throughout the plant. Management reports that unnecessary labor expenses have been trimmed over 50 per cent in the past year.

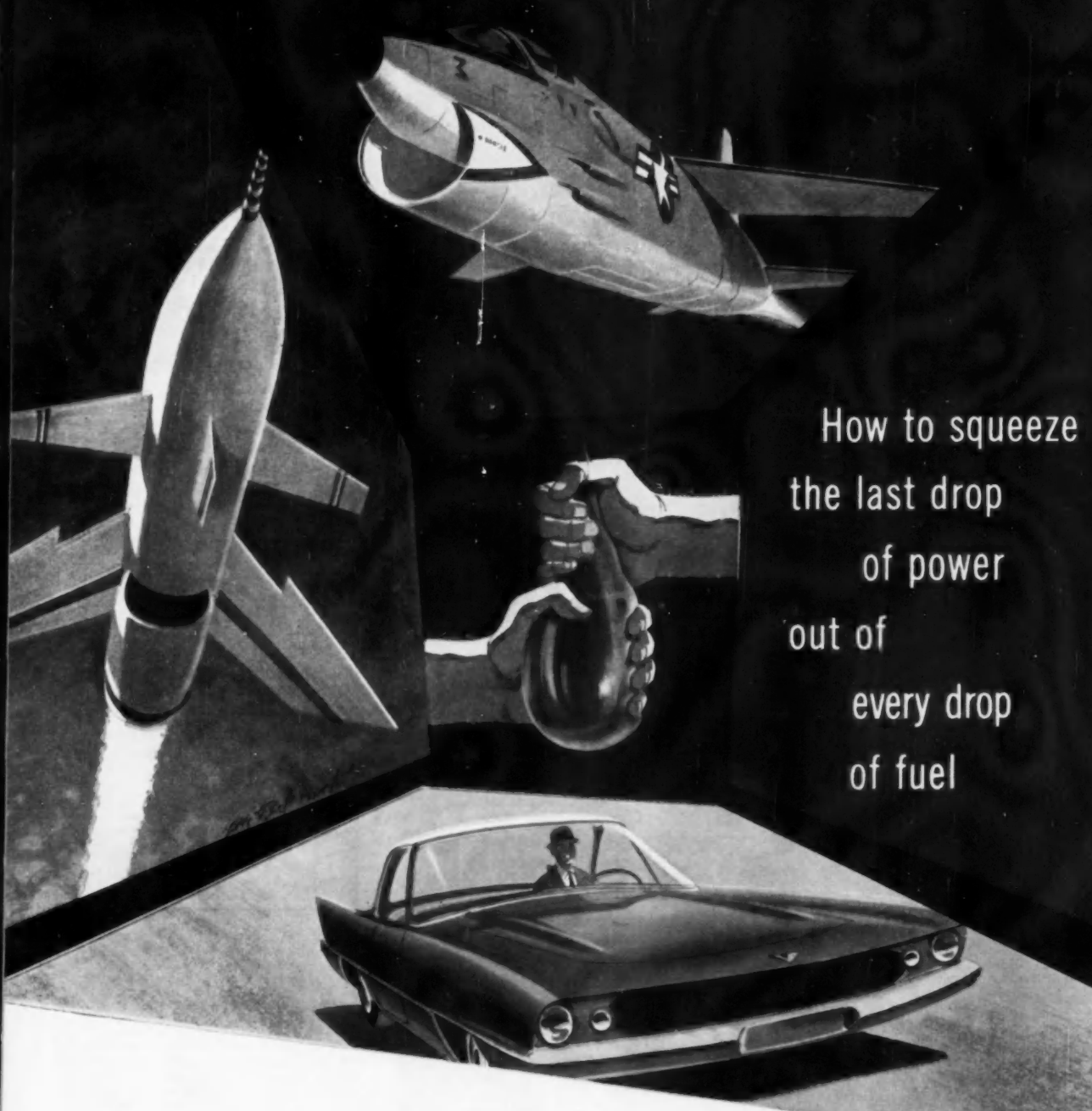
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The startling advances in the last decade in pounds of thrust, in horsepower have exceeded nearly every other decade in America's engine development history. The challenge of contributing to this advance has fallen to Holley engineering teams with such varied problems as lighter weight, more compact fuel controls for jet engines, carburetors with more and more breathing capacity, ignition systems with more and more accuracy.

Holley's two teams of design and manufacturing engineers have developed prod-

ucts as unlike the carburetors of the past as jet engines to Stanley steamers.

Today, Americans stand on the threshold of a decade which will far outmode the power outputs of today. Holley engineers are currently working on control systems for power outputs relegated just yesterday to science fiction.

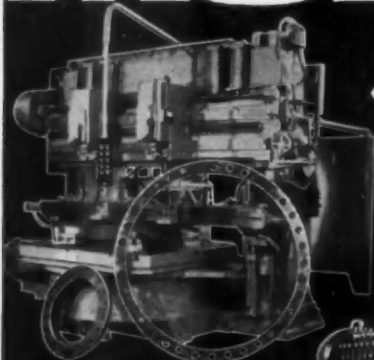
As in the last fifty years, Americans in motion will depend upon Holley products.

For more information about Holley products, automotive and aircraft, write to HOLLEY CARBURETOR CO., 11955 E. Nine Mile Road, Warren, Michigan.

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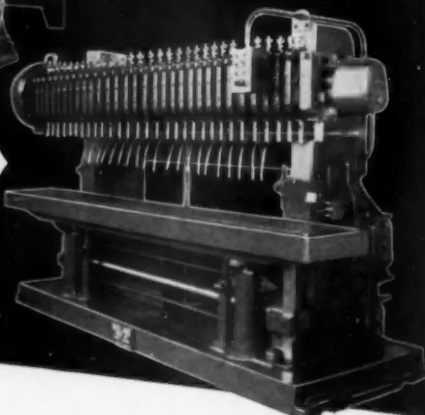
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HD68 drills bolt circles from 12" to 100" diameter. Each of the two spindles has capacity for 2 1/2" drill in steel. Operating cycle is fully automatic.

HD13 straight line-type drilling machine with capacity for thirty 3/4" drills in steel. Used for work on heavy castings, round and rectangular steel tubes, structural shapes, plates and grader blade drilling or countersinking.

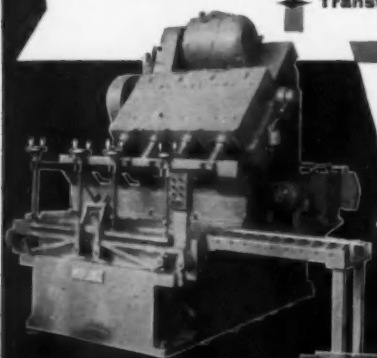


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MR152 performs drilling, reaming, spot facing and chamfering operations on tractor rear axle housings. A companion machine, MR151, does tapping in addition to the foregoing operations. Work holding fixtures are mounted on power driven trunnion.



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109

AIRBRIEFS

(Continued from page 86)

we can't afford to relax and rest on our laurels, the general warns. He said every day of the year the ballistic missile program of the Air Force alone is costing \$3 million. And it will run higher next year.

Lockheed Sees 2000 MPH Airliner In Near '60s

Lockheed's senior vice president Hall Hibbard predicts a commercial airliner that will fly at 2000 mph in the "glorious '60s." "At Lockheed we are really dead serious about it. Such an airplane could be started early next year. The prototype could be flying in three years. Oddly enough, about 1000 mph presents just as many problems, so we aren't even thinking about such a relatively low speed," he says.

Planemakers "will make greater use of steel and titanium in building the supersonic transport. The design of an adequate cockpit and passenger cabin refrigeration system will be tremendously important," Hibbard predicts.

BOOKS...

STANDARD AIRCRAFT HANDBOOK, by Stuart Leavell and Stanley Bungay, published by Aero Publishers, Inc., 2162 Sunset Blvd., Los Angeles, Calif. Price, \$2.75. Twenty-eight of the major aircraft factories and materials suppliers of the U. S. collaborated in the preparation of this reference and training manual intended for aircraft workers and mechanics in factories and maintenance companies. The volume covers riveting, bolts and fasteners, tools and their proper use, assembly and installation methods, materials and fabrication, blueprint reading, lofting, and templates. It also includes the most-common AN standard parts, as well as the latest aluminum alloy designations.

POLYURETHANES, by Bernard A. Bombrow, published by Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y. Price, \$4.50. The remarkable uses and possibilities of the polyurethanes are discussed in detail in this new volume. It includes their many applications as foams, and as coating, rubber (castings as well as tires), and adhesives. These latter three applications are now assuming greater importance, and are fully covered here. The book also explains why America's yearly production capacity of polyurethanes has reached 70 million lb, what this production is used for, and what the future holds in this field.

(Advertisement)

A Review of the Phosphate Coatings

Specified for the Protection of Metal Surfaces

By HUGH GEHMAN, Assistant Manager, Product Development Dept., Amchem Products, Inc.

Phosphate coatings are protective inorganic finishes that actually change the chemical nature of metal surfaces. The metal reacts with the applied phosphate solution to form a nonmetallic, crystalline coating which serves to:

- Improve paint adhesion
- Provide protection against corrosion
- Increase lubricity of friction surfaces
- Facilitate mechanical deformation of metals
- Decorate—in many instances

Satisfactory protection of steel, zinc and aluminum surfaces against corrosion, paint peeling and blistering, and hard wear requires precision methods of chemical conversion coating.

Types of Conversion Coatings

There are seven classes of chemical conversion coatings commonly specified and used throughout industry today. They are as follows:

Zinc-iron phosphate (ACP Granodine®). This is the heaviest type of coating (gray in color) used for prepaint treatments on steel, iron and zinc surfaces. The process requires five or six operations: cleaning; rinsing; rust removal, if necessary; coating; rinsing; and a second rinse. Coating weight ranges from 100 to 600 mg per sq. ft.

Medium or large volume production of automobile bodies, appliances, projectiles and cabinets can be handled effectively.

The coating solution improves paint adhesion by forming a crystalline deposit over the metal surface. This deposit is rough, as revealed microscopically, and so offers an ideal gripping surface for paint particles.

Manganese-iron phosphate (ACP Thermoil-Granodine®). This is a heavy black coating used on friction surfaces to prevent galling, scoring and seizing of parts. Typical metal parts treated are pistons, piston rings, gears, cylinder liners, camshafts, tappets and various small arms components.

Iron phosphate (ACP Duridine®). This is a comparatively new process that places a light coating on surfaces for improved paint adhesion. Since cleaning and coating occur in the same bath, it has only three to five stages.

The iron phosphate treatment is a spray process suited for medium to large volume, large or small work. Pre-cleaning is normally unnecessary, an economy factor in its favor.

Products protected by this process are steel or iron fabricated units, such

as cabinets, washing machines and refrigerators. Weight of coating is 50 to 100 mg per sq. ft.

Zinc phosphate (ACP Lithoform®). This is a crystalline coating produced on galvanized iron and other zinc surfaces—also cadmium—for improving paint adhesion. The purpose of the coating is to provide a paint-gripping surface and to prevent the reaction between acidic components of the paint and the zinc metal, with the formation of soaps and loss of paint adhesion.

This coating is applied in weights of 75 to 500 mg per sq. ft. There are no limitations on volume or production or on size of products treated. Zinc phosphate coating is used on zinc alloy die castings, zinc or cadmium plated sheet or components, hot dip galvanized stock, and Galvanneal.

Amorphous phosphate (ACP Alodine®). This is a relatively new protective coating for aluminum and aluminum alloys. It may be used in place of anodic deposition for improved paint adhesion and corrosion resistance.

This coating is practical for production in any volume. Coating weight is 100 to 600 mg per sq. ft. Products treated include helmets, belt buckles, aircraft and aircraft parts, bazookas and rocket motors, roofing and siding. Particularly good when aluminum is painted prior to forming.

Zinc-iron phosphate for oil absorption (ACP Permادين®). This is a relatively heavy coating adapted to the retention of rust-inhibiting drying or nondrying oils and waxes on ferrous metal surfaces. The coating is applied to a weight of 1000 to 4000 mg per sq. ft.

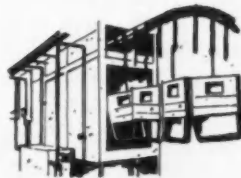
The process is satisfactory for large or small work in any volume—nuts, bolts, hardware, guns, tools, etc.

Zinc-iron phosphate for metal forming (ACP Granodraw®). This is a specialized coating used in conjunction with a suitable lubricant to facilitate the cold mechanical deformation of steel. The coating acts as an anchor for the lubricant throughout drawing, extrusion, and cold forming operations.

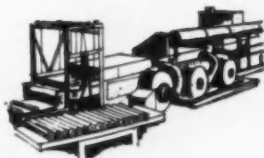
It is a successful treatment for products such as blanks and shells for cold forming, heavy stampings, impact extruded shapes, drawn wire and tube.

For more complete information about any one or all of these chemical conversion coatings, contact an ACP sales representative or write us at Ambler, Pa.

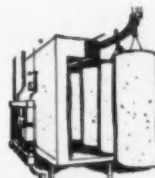
Typical Installations of Phosphate Coating Systems



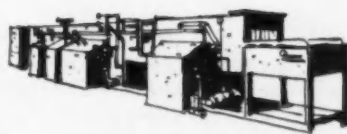
Customer: Truck manufacturer
Problem: Preparing cab parts for painting
Cycle: Phosphate wash; phosphate wash; rinse; chromic acid rinse; dry



Customer: Aluminum screen manufacturer
Problem: Final finish of aluminum shade screen
Cycle: Wash; rinse; phosphate coat; rinse; chromic acid rinse; dry



Customer: Water heater manufacturer
Problem: Preparation of water heater shells for synthetic enameling
Cycle: Phosphate wash; rinse; chromic acid rinse; dry



Customer: Hardware manufacturer
Problem: Preparing hardware parts for painting
Cycle: Wash; rinse; phosphate coat; rinse; chromic acid rinse; dry

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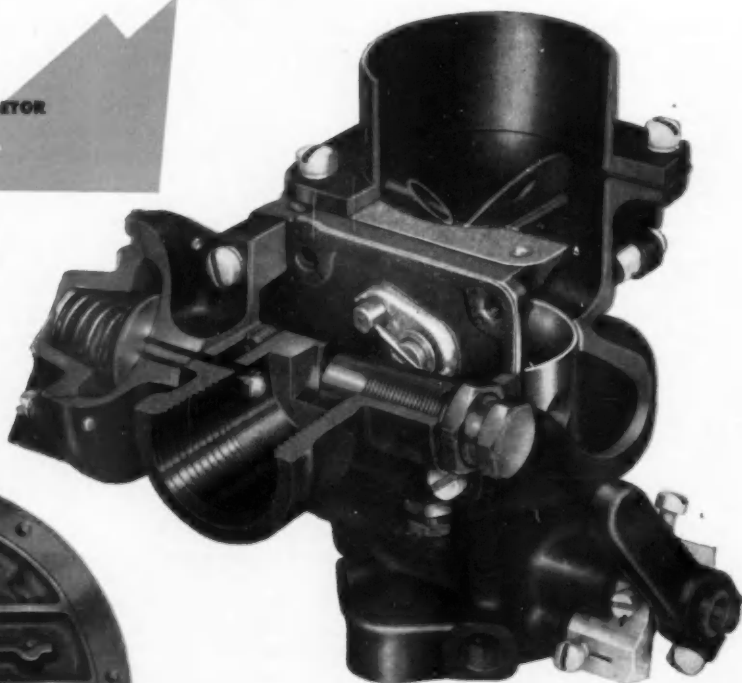
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Rocket Engines and Nondestructive Testing

By Dr. R. P. Frohberg

Chief, Production Development Laboratory
Rocketdyne, a Division of North American Aviation, Inc.

IN virtually any discussion on the current status and activity in the vital rocket and missile industry, the subject of reliability will play a prominent role.

Reliability

Reliability, of course, is not new. We can think of reliability in many different ways; however, the simple mathematical concept is sufficient: it is the probability of the successful performance of a part or system when called upon to do its job.

Reliability has been with us since the time of the Industrial Revolution. Ever since man devised machines to lighten his load, he has been plagued with equipment breakdowns of one sort or another. Races between the early steam locomotive and horse drawn vehicles, and contests between the first sewing machines and seamstresses, in essence, amounted to challenges to, or demonstrations of, the reliability of the newly-developed machines.

Automatic Chokes

A more recent example of reliability development is the automatic choke in the automobile industry. A few years ago people had trouble in the skillful use of the manual choke. All too frequently the end result was a run-down battery or a flooded carburetor, or both. There was an answer to this; a choke butterfly valve whose position was determined by the temperature of the engine.

The principle and mechanism are both very simple; yet the automatic choke was introduced in commercial cars in the late '30s and has gained widespread acceptance only in recent years. This is an example of a relatively simple

device which achieved a very high

degree of reliability through a lengthy program of field test.

Aircraft Automatic Devices

In the aircraft industry there are many cases of automatic or semi-automatic devices which have had to stand the test of time before attaining the necessary reliability for widespread acceptance.

In the case of unmanned flight, however, there is no pilot or operator to make corrections for

(Turn to page 113, please)



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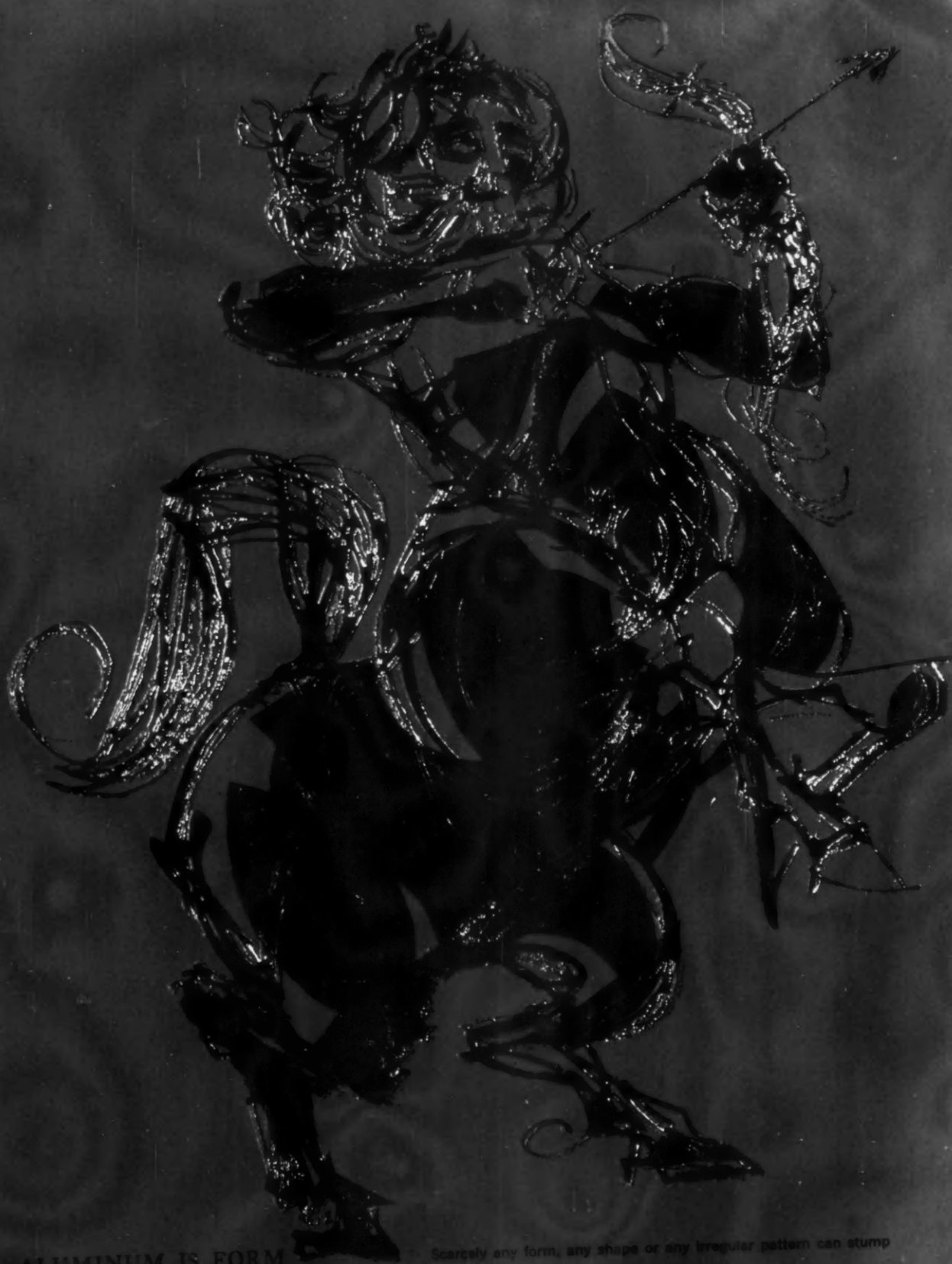
There's endless enticement for car buyers in the myriad shapes that aluminum takes. An intricate, silvery fretwork of grille, graceful seat shields or twin head lamp doors . . . these are some of the products from Mirro Aluminum Company, Manitowoc, Wisconsin, that help put enchantment in auto showrooms.

Mirro works Alcoa® Aluminum into stampings, formings and rolled sections of illimitable shapes and designs. Each is receptive to a broad array of chemical and mechanical finishes and each is custom-crafted with the same skill that goes into Mirro housewares, sporting equipment and other top sellers.

Alcoa does not make automotive trim. But our creative partnership with such fabricators as Mirro Aluminum has far advanced the arts of forming, coloring and texturing aluminum. Detroit has lost no time in capitalizing on this advancement, as a glance down any Main Street shows.



ALCOA  **ALUMINUM** gives every car more **GLEAM AND GO**



ALUMINUM IS FORM

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ALCOA IS ALUMINUM

ALUMINUM IS FORM . . .

Cast it: Aluminum can be cast in sand, die, plaster and permanent molds. Smooth surfaces, close tolerances, high-density nonporous parts are obtainable. Neither shape nor size presents a problem. Thinner, more uniform walls are possible.

Coin it: Many aluminum alloys are ductile enough to permit coining of amazing detail. No protective coating is needed; aluminum's surface characteristics assure long-lasting fidelity of reproduction. Semi-coining, a combination of embossing and coining, eliminates the labor of hand-chasing aluminum surfaces.

Draw it: Aluminum lends itself to odd shapes, as well as the usual rectangles, cylinders and hemispheres. Most shallow draws can be made on single-action presses at the highest speeds possible. Tooling costs are kept low; cast-iron tools can be used for short runs.

Extrude it: Parts with complicated cross sections make ideal extrusions. Metal can be massed where it's needed; strength increased while weight is reduced. Die costs are moderate, tooling simplified. Welding, forming, riveting, machining and expensive assembly work are eliminated.

Impact it: Hollow, cup-shaped shells, flanged or cup-end tubes, solid shapes and combinations of these forms lend themselves to aluminum impacts. Smooth, bright, scaleless, with no parting line and no draft to trim, aluminum impacts match the strength of forgings. High production speeds at lowest cost are possible because machining, fabrication and assembly are eliminated.

Forge it: Long die life, high mechanical properties, precision tolerances, zero drafts—these are some of the arguments for aluminum forgings. Larger, more intricate shapes can be forged because of the great weight savings. Thinner webs and ribs are possible. (Aluminum forgings have smoother and more uniform surfaces.)

Machine it: Aluminum can be turned at the highest speeds and feeds, to the most precise tolerances possible. Extremely fine finishes are attainable. Tools last longer. Plating is eliminated.

Stamp and form it: Standard tools and techniques can be used to stamp aluminum, allowing for a simple springback in forming dies. Sharp, clear letters, figures and decorations are raised. Dies last longer due to aluminum's easy machinability.

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Experienced, highly trained engineers at Mirro Aluminum draw on Alcoa's vast research and development experience to work out intricate design and production problems. For information about forming aluminum by drawing, stamping or roll-forming operations, write: Mirro Aluminum Company, Manitowoc, Wis.

Rocket Engines

(Continued from page 109)

equipment malfunctions during operation. In case of malfunction of the automatic choke in an automobile, or the automatic pilot in aircraft, we can always depend upon the judgment of the human brain to take remedial action.

In missiles, however, we prepare a set of instructions beforehand and the entire operational sequence is programmed and played back during flight. It is, of course, possible to anticipate certain malfunctions and include corrective measures in the program; however, it would soon require an excessively complex system if all correction factors were included. In essence, no machine or gadget is the equivalent of human judgment.

We also have remote controlling systems which are very powerful; however, they depend upon observation of the vehicle in question and correction from a nearby plane or from the ground. In today's long range missiles and space vehicles, this is not practical.

Missiles and Rockets

In the missiles and rocket industries, today, we are faced with the problem of condensing enormous development and test programs into a very short span of time. This naturally raises the question of how we measure reliability.

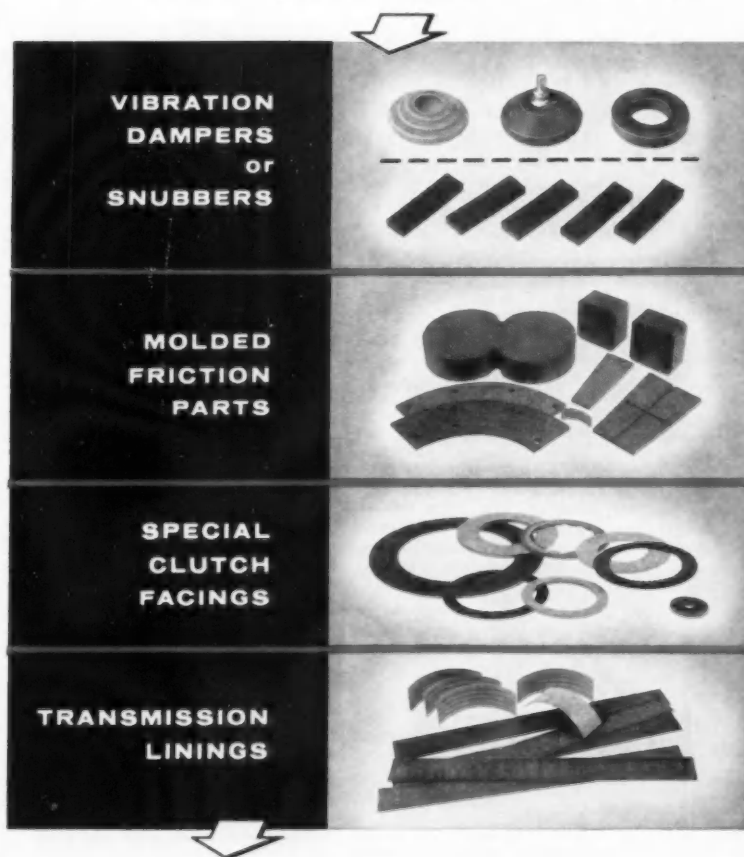
The direct and positive measure, of course, is the operational performance of the engine in question. We approximate this operational performance with block or stand tests on the completed assembly.

Prior to that, we do quality verification and reliability assurance tests on the accessory components and sub-assemblies as bench tests. This gives us some idea of how a part may perform in static test and in subsequent operational service.

The fourth method of testing to determine reliability goes into the area of nondestructive testing. In its broadest sense, this includes visual examination, pressure tests, dimensional checks, radiography, ultrasonic and similar classical nondestructive tests. There is a

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wide variety of similarities and dissimilarities between these four evaluation procedures.

Limited Output

Probably the most significant difference is economics. If we were able to build and place into operation unlimited numbers of missiles and engines, we could develop a very high degree of reliability. This, of course, is not practical from a time or expense viewpoint.

Test stands, although expensive,

approximate operational performance at considerably less expense than operation service. At this stage of testing, many deficiencies otherwise unrecognizable will be brought to light.

Nondestructive Tests

Before parts are given a stand test, it has been found economical to screen them through bench tests. This may be a relatively simple operational check with regulator or valve equipment, or

it may be a complex test involving stress, temperature, or other environmental factors.

The field of nondestructive testing is the foundation of this concept, and is, by far, the least expensive of all test methods. If judiciously chosen, it can also be the most economical. We all realize it is foolish to machine a casting unless we are assured that the casting itself is of acceptable quality. Similarly, weldments and forgings are evaluated from a quality viewpoint before any more money is put into them.

The Nondestructive Testing Engineer

This, then, is where the nondestructive testing engineer fits into the overall picture. He is a vital link in the long chain from raw materials to finished parts, and progressive companies have found that they cannot afford to bypass nondestructive testing. It is simply a matter of sound economics and good business to know that the part has been made right the first time.

Two points concerning the activity of a nondestructive test engineer are vital to any manufacturing effort in general, and more important than ever in the missile program.

The first is concerned with the test itself; that is, the interpretation of an indication. Is the indication real? Is it harmful? If so, what is the source? Hence, what is the disposition?

Costs of Tests

Tests cost money if only in time expended, and an accurate appraisal is necessary to make the test pay for itself. We would soon be out of business otherwise.

Experience in nondestructive testing is filled with many examples of false or spurious indications.

In the ultrasonic testing of 16-25-6 alloy, we find reflections from grain boundary precipitates. In the case of magnetic particle inspection, under some conditions it is possible to show flow lines in forgings. In radiography, we have all seen examples of shadows which were the result of scattered radiation or reflections from jigs

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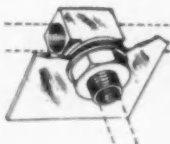
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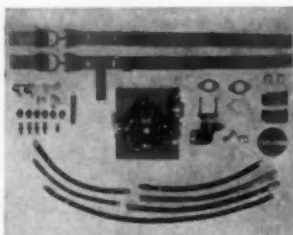
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Complete copies of Underwriters' Laboratories "Listing by Report" showing actual photographs of installations with instructions, diagrams, etc. are available from Beam Products Mfg. Co. or from Underwriters' Laboratories covering the following trucks — Yale Models KG-51-30 through KG-51-100 with suffix letters A, AT, T, R, P and S; Hyster Models UE 30, YE-40, HE-50, UE-30T, YE-40T and HE-50T; Clark Carloader Models 3024, 4024, 5024, and Towmotor Models 420-460-480-480P-500 and 500P.

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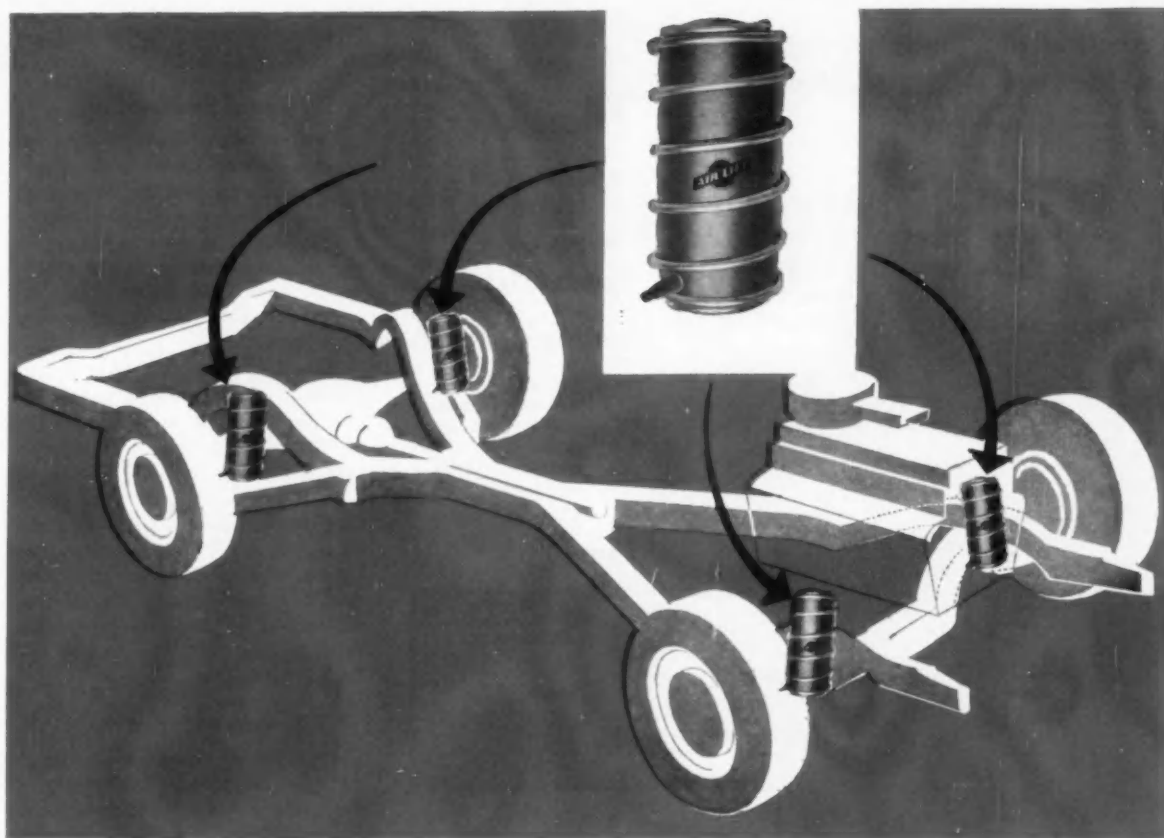
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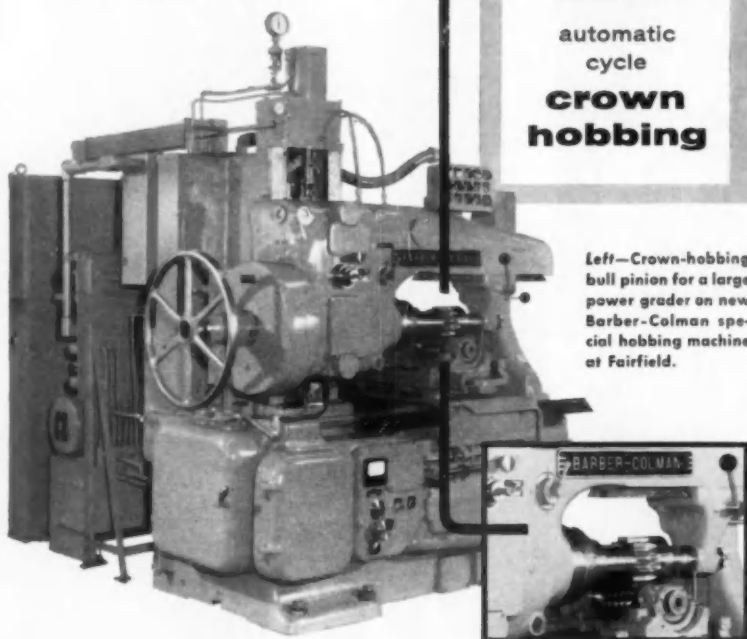
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or other sections of the parts to be radiographed.

Visual Examination

Even visual examination can become difficult under some conditions. For example, we frequently think of blast cleaning as a method of preparing a cast surface for visual examination. However, under some conditions this can mask fine scratches or other surface blemishes.

But the mere fact that a test operator has turned up an indication is of no value in itself. The first step is to determine whether the indication is real.

Once it has been determined that the indication is a material or processing flaw, the next question is whether it is harmful. (We would soon go broke if we attempted to make perfect castings, perfect weldments, and perfect forgings.)

Requirements of Part

In order to make an intelligent decision at this point, the non-destructive testing engineer must be thoroughly familiar with the requirements of the part. He must have a good and complete engineering drawing. He must know the service environment of the part; whether it is a pressure vessel; whether it is subjected to fatigue stresses; or other specialized service conditions. As long as we are in engineering, the part must be built for a profit and not for artistic or esthetic value. This is not to belittle craftsmanship, but rather to take a practical economic view of various fabrication processes.

Now we come to the meat of the problem.

Origin of Defects

Once we have determined the existence of a harmful flaw, the next question is what disposition is to be made. Did the casting flaw have its origin in the pattern, molding, or melting practice?

In considering castings, we can prepare a long list of possible sources in imperfection in the finished casting: melting stock, foundry sand, molding practices, core making practice, melting and fluxing, gating, pouring, and a wide

THE ACCENT IS ON PRODUCTION in a production line by **FEDERAL**

On this production line, designed and manufactured by The Federal Machine & Welder Company, automatic washer spinner tubs are fabricated from coil steel to finished product in a matter of minutes.

The Federal Machine & Welder Company, as a manufacturer of resistance welders and Warco presses, and affiliated with Berkeley-Davis, Inc., manufacturers of automatic arc welding equipment, is in a unique position to be able to develop lines that incorporate many different metalworking operations.

Nine Steps From Raw Material to Finished Product

- 1 Coil stock is blanked and punched on Warco press.
- 2 Destacker picks single sheet and feeds production line.
- 3 Sheet is roll formed into a cylinder and spot welded.
- 4 Special transfer unit moves tub to expander.
- 5 Expander hydraulically sizes tub and flanges ends — also forms vertical ribs.
- 6 Warco presses blank and form back plate.
- 7 Back sub-assembly, consisting of 4 parts, is spot and projection welded in 3-station transfer welder.
- 8 Front plate and back assembly are automatically positioned and inserted into body.
- 9 Double end seamer tack seams front plate and back assembly to body and ejects finished tub.

* Sequence of operations controlled by static relay system designed and built by Federal.

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variety of other sources which are only too well known to the foundryman.

Any number of nondestructive test engineers have been caught up in the eternal triangle of the foundry, the heat treater, and the machine shop. This is the most difficult and the most important part of the testing engineer's job; to pinpoint the origin of the defect.

Materials Processing

This seems like a relatively sim-

ple requirement; however, it means that in addition to a thorough understanding of a particular non-destructive testing tool, the engineer must know materials processing. The knowledge of foundry and forging practice is more important than experience with a particular testing tool. There are some defects in forgings, for example, which may be regarded as congenital—their origin may be traced all the way back to the open hearth furnace at the steel mill.

Appropriate at this point is the story of the dauntless metallurgist who fancied himself an expert in the interpretation of metallographic structures. He claimed he could study a photomicrograph and tell all about the material and its processing.

As usually happens in cases like this, someone called his bluff by asking for an interpretation of a photographic print which looked like a metallographic surface. The metallographer immediately went to work and stated that this was obviously a low alloy steel forging of certain carbon content with certain other metallographic features.

He went on with a description of a heat treatment, and stated that only the mediocre quality of the specimen restricted him to this limited interpretation.

The metallographer's friend informed him that he was looking at a ginger snap, at low magnification!

It is easy to misinterpret data when we have only part of the story. In short, if we are going to make the test pay, we must be able to pinpoint the origin of the defect and evaluate its significance. This can be done only with a thorough knowledge of processing and the detailed processing history of the part in question. Only then can intelligent and economical disposition be made.

Education of Customer

The other area in which the non-destructive test engineer must strive for perfection is in education: the education of the customer or consumer of nondestructive tests.

Most of us have seen examples of the incorrect use of nondestructive tests at one time or another. Aside from poor economics, the other result is that whoever specified the test did so thinking that he had the protection of that test. When a part fails, he feels that the test was inadequate. This, then, gives him a distorted outlook on a particular test method.

Consider the engineer who designs a particular part or assembly. His first question is: how can I best assure myself of a top quality casting or weldment?

(Turn to page 120, please)

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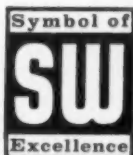
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NEW YORK: A camera maker coats flash bulb reflectors with black vinyl paint outside and aluminum paint inside. "Stripper S-A is the fastest ever used on our rejects."

OHIO: A maker of toy pistols had trouble stripping alternate coats of lacquer and metallized aluminum. Now "Stripper S-A does it amazingly fast and remetalizing is completely satisfactory."

CALIFORNIA: A producer of metal furniture uses Stripper S-A to remove clear epoxy from plated parts. Chemist says "This is the best stripper on the market."

ALABAMA: A hardware maker had trouble stripping lacquer from brass door knobs. Oakite Stripper S-A now does the work in "less than 1/2 the time taken by any other stripper."

NEW YORK: A manufacturer of business machines tested several strippers on various finishes on steel and aluminum. Verdict in favor of Stripper S-A was: "It's doing a wonderful job."

CONNECTICUT: A maker of brass lipstick shells has found that "Stripper S-A quickly strips epoxy lacquers from rejects and heavily coated work spindles."

CALIFORNIA: A missile maker reports that "Stripper S-A is doing a fine job stripping vinyl from stainless steel and titanium."

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Rocket Engines

(Continued from page 118)

Combination of Tests

The answer is not always x-ray, nor is it magnetic particle inspection, nor any one single tool. The answer may be partly x-ray, or partly fluorescent penetrant or perhaps neither.

In heat treated steel gears, for instance, aside from hardness, magnetic particle and etch tests which are of limited value, we have no good nondestructive tests for case depth on the finished part. We control the quality of heat treated steel gears by controlling the processing. There are other examples where ultrasonic or x-ray testing can be a waste of money.

Economics of Techniques

Surprisingly few design engineers consider the economics of various testing techniques and the information they get for the money expended, and there are many examples of the indiscriminate use of radiography. A large number of engineers still feel that all cracks can be detected radiographically. One of the first things a test engineer must realize is the limitations on the various testing methods, and pass these limitations on to the designer.

In the ideal case, the nondestructive testing engineer should be a part of the design team. Just as the metallurgist aids in the selection of material and its processing, and as the stress analyst offers his knowledge in a specialized field, the nondestructive testing engineer will aid in the intelligent choice of tests.

Design Changes

Perhaps a small design change could be made to facilitate testing by some particular method. Something as simple as the manner in which drawings are dimensioned can materially assist the bench inspector when he lays out a part for dimensional inspection.

Once again in the selection of a test method we face economic considerations. The significant thing is not which tool is cheapest, but which tool, like stocks and bonds,

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WIRE INSERTS PUT CAST IRON WEAR IN TOP RING GROOVE

G and E Wire Insert Piston before machining (left) and after ring grooves are cut (right) showing how the steel wire forms a tough wear-resistant surface on both faces of top ring groove. The ferrous plug molded in the head (for diesel pistons) prevents burning through head and lengthens diesel piston life!

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GET THE G AND E WIRE INSERT STORY—It will save piston money, maintenance costs, and cut operating costs.

With the thousands of G & E "Wire Insert" Pistons in use for periods up to 3 years—a phenomenal record for trouble-free operation has been established. The "Wire Insert" greatly reduces top ring groove wear and increases piston life.

The "Wire Insert" piston design—exclusive with G & E—combines all the advantages of aluminum alloy pistons with the long life of steel in the top ring groove. No noticeable increase in weight—unequalled for rapid heat flow—and at low cost.

G & E Wire Insert Pistons have a pre-shaped steel wire cast right in the piston wall where the top ring is located. When the grooves are machined, the closely spaced wire surfaces form hard bearing areas on top and bottom faces of the groove. Result—reduced ring land wear, longer piston life at lower cost.

GILLETT AND EATON, INC. 841 DOUGHTY STREET • LAKE CITY, MINN.



ESTABLISHED 1868

will give the greatest yield on the investment.

There are, unfortunately, disillusioned designers who say, "I have already tried this test and it isn't worth a darn." Most likely they do not have a full understanding of the various nondestructive testing methods.

Rocket Engine Testing

Let us consider some examples of the value of intelligent nondestructive testing and quality con-

trol in a large liquid propellant rocket engine.

The thrust developed by a rocket engine varies directly with the mass flow rate or the rate at which hot gases pass through the engine. This is based on Newton's third law, which states that "for every force there is an equal and opposite reaction."

It is evident, then, that the pumping system which pumps fuel and oxidizer into the engine is literally the heart of the rocket

engine. This high capacity pump is driven by a powerful gas turbine through a gear train.

This article will be completed in an early issue of AUTOMOTIVE INDUSTRIES.

• • •

GM Develops A-C Generator For Use in Passenger Cars

Delco-Remy Div. of General Motors announced the development of a new self-rectifying a-c generator and a non-mechanical transistor voltage regulator for passenger cars.

Donald L. Boyes, Delco-Remy general manager, said the new Delco-Remy "power team" will be available later this year and is expected to see immediate use on special service vehicles such as police cars, taxi cabs, delivery cars, and light trucks.

Delco-Remy engineers said the new system will deliver 26 amperes at engine idle and up to 60 amperes at higher speeds. The compact generator, which weighs only 31 lb and is 5.75 in. in diameter, can fit into the same mounting lug spacing as present standard 12-volt, d-c generators.

The self-rectifying feature of the a-c unit is accomplished with six silicon diodes built into the end frame of the generator. The electronic regulator has no moving parts and can be mounted in any position.

The company pointed out that a-c generators developed by Delco-Remy now are in use on trucks, buses, and Army vehicles, but in these applications the rectifier is a separate unit requiring additional wiring and mounting space.

Chrysler Uses New Equipment To Make Differential Parts

Chrysler Corp. has found that its new production equipment for differential cases and carriers has improved quality control, upped production capacity, and lowered costs.

Chrysler now makes the two basic differential components for all of its 8-cylinder passenger cars at the Axle and Transmission Div. Lynch Rd. plant in Detroit. It uses two identical Cross Transfer-matic machines for the case and two W. F. and John Barnes machines for the carrier.

The twin Cross machines, each with double lines, have a total capacity of 448 units an hour. The Barnes machines have a total capacity of 432 units an hour for the two double lines. Capacity in both operations is (Turn to page 124, please)

Depend on EUREKA RADIATORS for RUGGED ENDURANCE & MAXIMUM COOLING

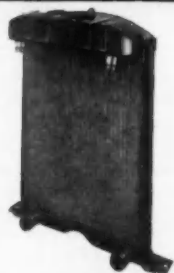


EUREKA

OVER 30 YEARS OF SPECIALIZATION

For over 30 years, EUREKA Cores and Radiators have served the automotive industry with utmost dependability. Our facilities, equipment, and personnel are available for your needs. We welcome the opportunity of integrating our specialized skills with your needs to help you achieve a well-planned production schedule.

What are your requirements? We can build Radiators to your order in any type, to any size or shape. Send us your blueprints for prompt quotations!



EUREKA RADIATORS AND CORES

for CARS, TRUCKS, TRACTORS and SPECIAL APPLICATIONS.

AUTO RADIATOR Manufacturing Co.

Guaranteed Radiator Cores Since 1915

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CHICAGO 16, ILLINOIS

**REDUCE TRUCK CAB
WEIGHTS** as much as

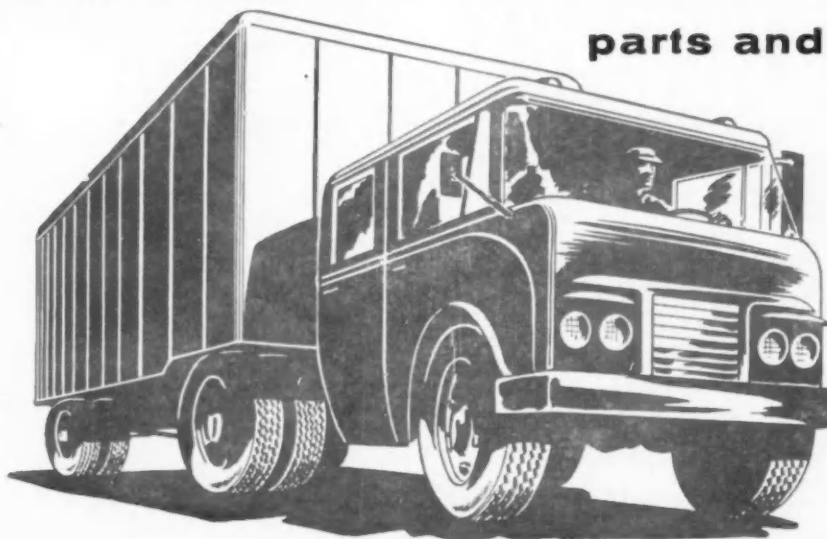
REDUCE TOOLING COSTS

40%
80%

with

MOLDED FIBER GLASS

parts and assemblies



"A pound saved earns a dollar a year," say the trucking companies.

And MOLDED FIBER GLASS parts save pounds and pounds . . . they weigh 40% less than metal parts. That's one reason why so many truck and trailer manufacturers are starting to use MOLDED FIBER GLASS molded pieces and flat sheet for body parts and assemblies . . . from fenders to complete, assembled cabs.

Other important reasons are:

Tooling costs for MOLDED FIBER GLASS parts are 80 to 85% less than for metal;
Time required for tooling is 50% less;

Complete MOLDED FIBER GLASS cabs—as assembled in Molded Fiber Glass Body Company plants—cost little or no more than contoured steel cabs;

MOLDED FIBER GLASS body parts do not rust or corrode . . . do not dent . . . provide sound and temperature insulation;

If and when major damage occurs (which would badly distort metal),
MOLDED FIBER GLASS can be easily repaired.

MOLDED FIBER GLASS offers design possibilities not obtainable with metal . . . and MOLDED FIBER GLASS executives are always available to discuss your designs. Just write or telephone for information and literature.



MOLDED FIBER GLASS is the exclusive trade name for fiberglass reinforced plastic products custom molded by the affiliated Molded Fiber Glass Companies.

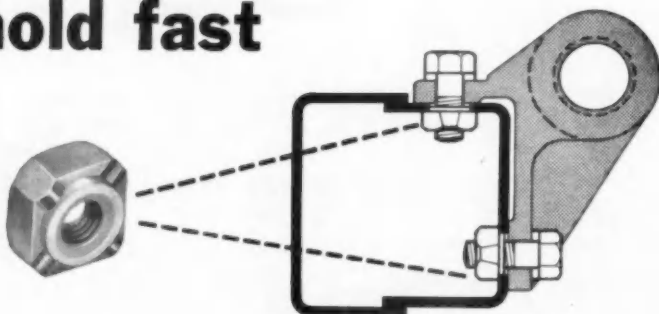
MOLDED FIBER GLASS BODY COMPANY

4611 BENEFIT AVENUE, ASHTABULA, OHIO

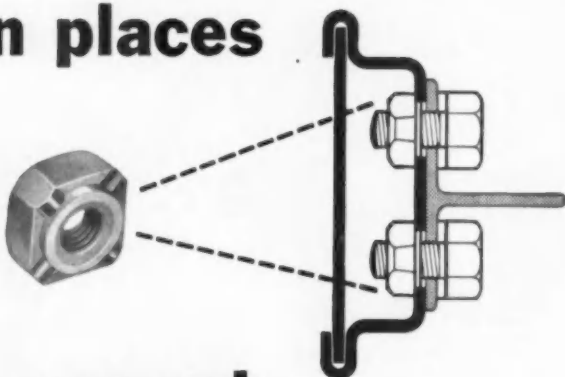
MIDLAND

WELDING NUTS

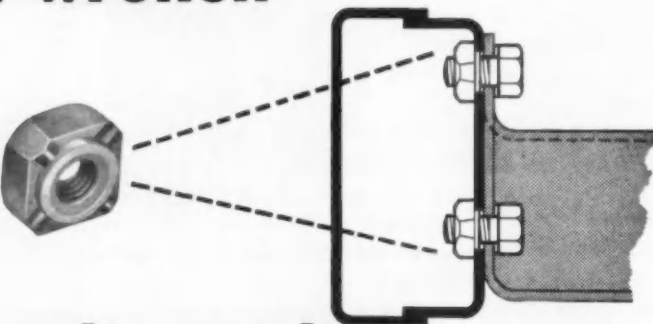
hold fast



in places



a wrench



can't reach

Looking for cost and time-saving tips? Send for the free booklet showing you how to "Save With Midland Welding Nuts."

MIDLAND-ROSS CORPORATION

WELD NUT DIVISION

6660 MT. ELLIOTT AVENUE • DETROIT 11, MICHIGAN

(Continued from page 122)

considerably higher than under the former single-purpose machine system.

The case and carrier lines, although cycled separately, have central coolant and chip disposal systems.

Senate Drafts Own Space Bill; New Agency May Be Stalemated

The Senate is drafting its own version of legislation creating a new Government space agency, considerably different from a measure already passed by the House.

As a result, creation of the new agency may be stalemated for this year as the two chambers reconcile conflicting plans.

The Senate measure was drafted by the Senate space committee, headed by Majority Leader Lyndon Johnson, D., Tex. Although stressing civilian control of space research and development, the bill specifically reserves to the military all developments associated with weapons.

The House bill calls only for cooperation between the new civilian space agency and military officials.

Another major difference involves the method for determining which projects would be strictly under the military. The Senate bill would establish a seven-member policy board with power to designate projects and resolve disputes. The House bill provides for a 17-member board with only advisory powers.

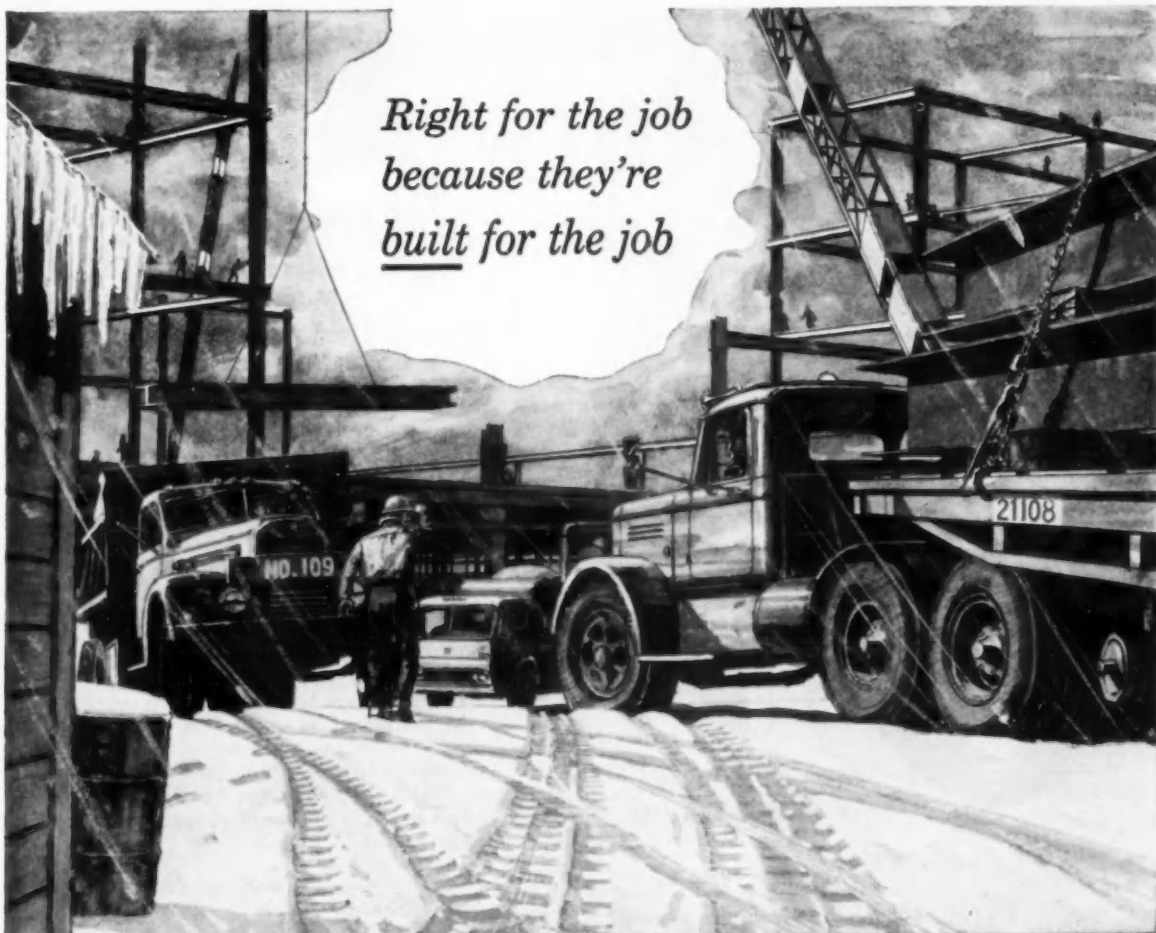
The House-passed measure is closer to the original White House plan for the new space agency, and will probably draw support of the President when the conflicts of the two bills are being resolved.

More Government Contract Awards

LATEST contracts awarded by various Government agencies, and covering primarily automotive and aviation products, are listed in the following. Typical of the items contained in these monthly listings are: passenger cars, motor trucks, aircraft, military tanks, engines, transmissions, other components, spare parts, etc. This list is for the period May 27 to June 26, inclusive.

(Turn to page 128, please)

AUTOMOTIVE INDUSTRIES, July 15, 1958



*Right for the job
because they're
built for the job*

EVANS HEATERS ARE RIGHT FOR TRUCKS BECAUSE THEY'RE BUILT FOR TRUCKS

It goes without saying that your truck has to be *truck built* all the way through. Including the heater!

You'll find *every* Evans heater is *truck built*. Each is designed to meet the specific heat and installation requirements of the type truck it is to serve. This means both correct BTU output *and* proper heat distribution ... something a warmed-over car heater cannot provide.

It also means longer heater life. To prove it, Evans backs every heater with a parts "repair or replace" warranty good for a full year or 50,000 miles, whichever occurs first.

An Evans heating engineer will be happy to work with you in solving *your* truck heating problems. Write for complete information: Evans Products Company, Dept. P-7 Plymouth, Michigan.

Regional Representatives: Cleveland, Frank A. Chase
Chicago, R. A. Lennox Co., Inc.; Detroit, Chas. F. Murray Sales Co.
Allentown, Pa., P. R. Weidner

EVANS PRODUCTS COMPANY ALSO PRODUCES:

railroad loading equipment; bicycles and velocipedes; Evaneer® fir plywood;
fir lumber; Evanite® battery separators; Evanite® hardboard;
Haskelite doors; Evanite Plywall.

EVANS PRODUCTS COMPANY

PLYMOUTH, MICHIGAN



IT'S
AMAZING...

the
number
of
applications
for

TETRASEALS

by *Goshen Rubber*

Rectangular-section rings
deliver many important
advantages!

Design engineers tell us TETRASEALS are not only amazingly high in performance, but amazingly versatile as well . . . using them in place of O-rings for static and in some cases moving applications. TETRASEALS are money-savers because they're interchangeable with standard O-rings, use the same groove, require no special tooling, and possess a homogeneous structure (non-laminated).

Edges are accurately formed, and cross-sectional tolerances are held to $\pm .003$ (depending on ID and OD, on cross-section sizes and on material required).

Only Goshen can supply TETRASEALS . . . in natural, synthetic and silicone rubber compounds to meet MIL, AMS, SAE, ASTM and industrial specifications.

Write for Technical Bulletin No. 11.



Goshen Rubber Co., Inc.

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ON OUR
WASHINGTON WIRE

President Eisenhower is standing pat in refusing to call a labor-management conference on methods of keeping steel prices from rising further. The conference had been suggested by Sen. Estes Kefauver, D., Tenn., outspoken critic of the steel industry.

In rejecting the suggestion, the President said: "A sensible wage-price policy is vital to our future economic health. It is important that management and labor, in steel and other industries, understand their own long-run interests in such a policy. It is necessary that each of the rest of us, in the way he believes best, help along in achieving this goal."

Russia has expanded her foreign trade enormously in the past few years. But this trade is not profitable. The prime purpose of Russian foreign aid and foreign trade is to gain in influence, in prestige, and good will. Says Mr. Khrushchev, "We value trade least for economic reasons, and most for political purposes."

When Russia gives or sells expensive equipment like steel-mill machinery or a chemical plant, capable technicians are sent along to make sure the job is done properly. Arms and military supplies are either given free or sold at low prices. Loans are at very low interest—usually 2 per cent.

Russian aid is clearly identified by means of signs and propaganda devices as gift or loans from Russia. American aid is not identified. It usually loses its identity when it leaves U. S. ports. It gets swallowed up in the mulch of the foreign economies it enters. Samplings of local opinion show that few foreigners are aware that U. S. aid is entering their economies.

The President is asking Congress to approve an agreement between U. S. and six European nations for installation of atomic power plants in each country. The plants would be designed primarily for electric power, not for research and development purposes.

Total cost of the six atomic-power reactors would be \$880 million. This country would extend some \$235 million in credits and spend up to \$190 million to aid construction of the reactors. They would produce a million kw of power by 1963. The rest of the cost would be borne by the newly formed European Atomic Energy Community (Euratom).

Military is going to increase its sales of scrap at the urging of Congress. The lawmakers say the expense of turning surplus goods into scrap for disposal is offset by savings in warehousing.

NOW! CONTINUOUS, FULL POWER TURBOCHARGING



**AiResearch control system
keeps turbocharger output at
ideal level**

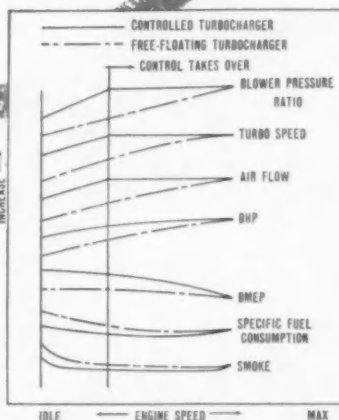


Accurate control of turbocharger speed over its complete range regardless of changing load characteristics has been achieved with the new AiResearch Turbocharger Control System. This automatic control system delivers more air to the engine when needed and greatly increases torque rise, giving turbocharged diesel engines greater lugging ability when operating under heavy loads. By contrast, free-floating turbochargers operate at reduced RPM when the engine is working at below-maximum engine speed.

This improved air delivery sys-

tem greatly increases the acceleration, for example, of turbocharged diesel trucks up steep grades. In a typical case, the round-trip time of a trucking company operating between Phoenix and Denver was cut from 48 hours to 42 hours. Over short hauls an off-the-road truck cut its 27-minute round-trip time to 18 minutes. Comparable gains are made for all types of turbocharged diesel equipment, stationary or mobile.

The two components of the new control system are a pressure ratio sensor and an exhaust by-pass valve. They control the speed of



Improved performance characteristics of a typical turbocharged diesel engine equipped with the new AiResearch Turbocharger Control System.

exhaust-driven turbochargers by modulating the amount of engine exhaust used. This eliminates overspeeding of the turboblower, and at the same time provides higher turboblower speed while lugging. Smoking is virtually eliminated under all conditions.

Your inquiries are invited.



AiResearch Industrial Division

9225 South Aviation Blvd., Los Angeles 45, California

DESIGNERS AND MANUFACTURERS OF TURBOCHARGERS AND SPECIALIZED INDUSTRIAL PRODUCTS

T-J spacemaker cylinder

Quality Engineered

to give quality results

with Extras...
at No Extra Cost!



You get more—much more—when you specify and use any of T-J's complete line of Spacemaker cylinders. The Spacemaker is engineered to give you better, more accurate, and longer service—offers, exclusively, many extras... that are STANDARD, AT NO EXTRA COST!

Designed to eliminate tie-rods, providing greater strength... saves space... reduces manhours and costs in all push-pull-lift operations. IMMEDIATE SHIPMENT in a wide range of styles and capacities, with 64,000 combinations. Write for Bulletin SM 155-3 with complete engineering details. The Tomkins-Johnson Co., Jackson, Mich.

TJ TOMKINS-JOHNSON
PISTONS, AIR AND HYDRAULIC CYLINDERS, CUTTERS, CLINCHERS

METAL PISTON ROD SCRAP-ER... Standard at No Extra Cost!

NEW "SUPER" CUSHION FOR AIR... Standard at No Extra Cost!

CHROME PLATED CYLINDER BORES AND PISTON RODS... Standard at No Extra Cost!

ONE PIECE PISTON... Standard at No Extra Cost!

NEW "SELF-ALIGNING" MASTER CUSHION FOR HYDRAULIC USE... Standard at No Extra Cost!

NO TIE-RODS TO STRETCH... Standard at No Extra Cost!

STREAMLINED DESIGN... Oil Pressure to 750 P.S.I.—air to 200 P.S.I. Standard at No Extra Cost!

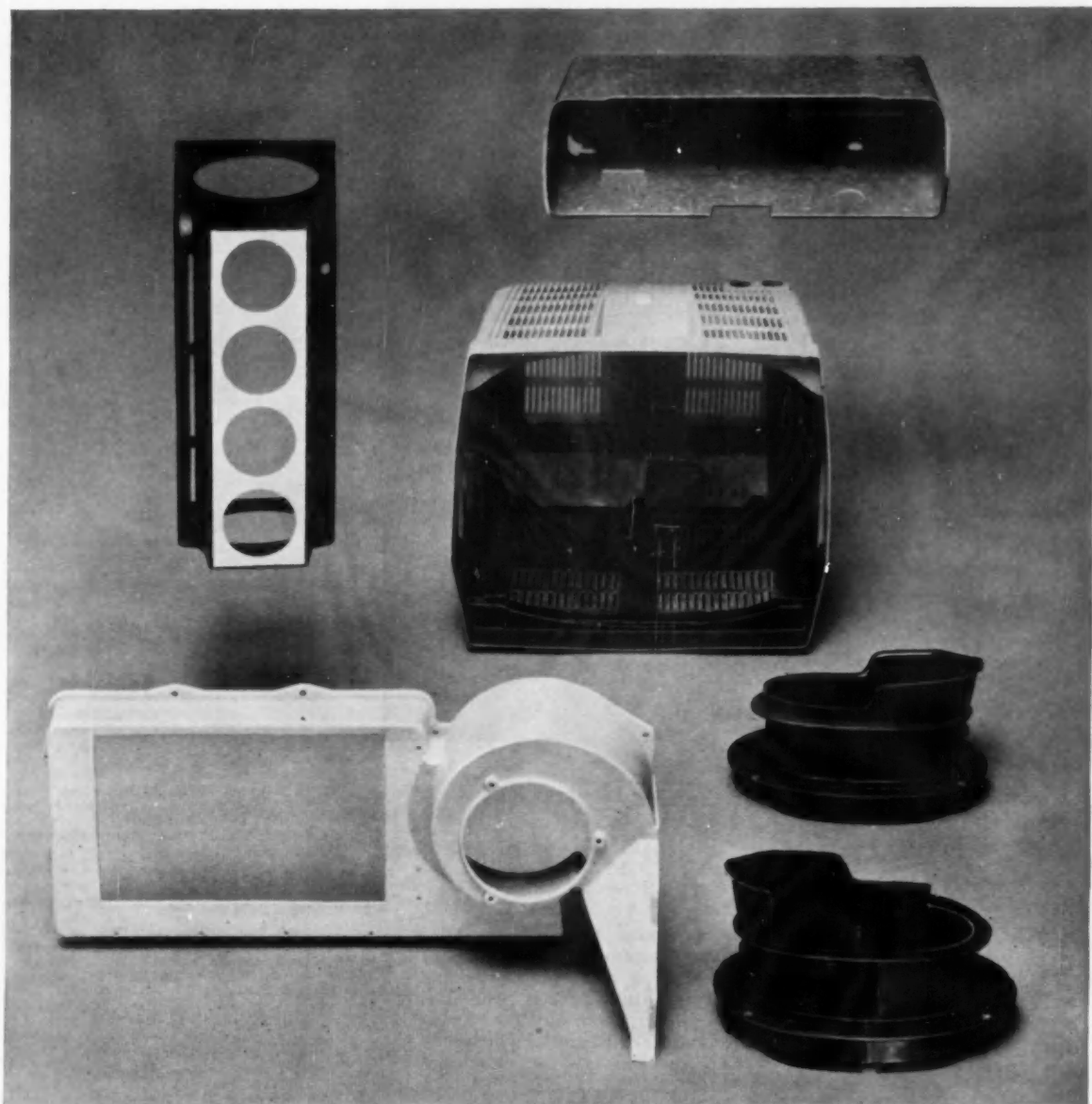
FORGED SOLID STEEL HEADS... Standard at No Extra Cost!

Contract Awards

(Continued from page 124)

- AC SPARK PLUG DIV., GENERAL MOTORS CORP., Flint 2, Mich.
Automotive spare parts, replenishment—\$3760 ea.—\$67,200
- AVCO MANUFACTURING CORP., Stratford, Conn.
YT53-L-3 Turbo-Prop aircraft engine for the OF-1 aircraft—\$1,800,000
- THE ARMSTRONG RUBBER CO., West Haven, Conn.
Tire, 9.00 x 20, 8 PR, T&B, ND, CC—26892 ea.—\$1,028,350
- BEECH AIRCRAFT CORPORATION, Wichita, Kans.
L-23D army liaison aircraft and data—\$2,061,651
- BELL HELICOPTER CORPORATION, Fort Worth, Texas
H-13H army liaison helicopter and data—\$3,394,800
- BENDIX AVIATION CORP., South Bend, Ind.
Wheel assy.'s, main, for B-66 aircraft—\$74,529
- BENDIX AVIATION CORP., ZENITH CARBURETOR DIV., Detroit, Mich.
Automotive spare parts, replenishment—284 ea.—\$33,319
- CANADIAN COMMERCIAL CORP., Washington, D. C.
L-20A army liaison airplanes, spare parts, ground support equipment—\$5,010,429
- CATERPILLAR TRACTOR CO., Peoria, Ill.
Tractor, full tracked, w/dozers—200 ea.—\$3,907,660
- Tractor, wheeled, industrial, DED—5 ea.—\$120,360
- CESSNA AIRCRAFT CORP., Wichita, Kans.
L-27A liaison aircraft, spares, ground support equipment data—\$4,093,651
- CHRYSLER MOTORS CORP., Detroit, Mich.
Truck, wrecker, 6 ton boom capacity, 2 ton, 4 x 2, 4 ea.—truck, tank, fuel oil and gasoline, 1200 gal., 158 ea.—\$691,184
- CHRYSLER MOTORS CORP., Washington, D. C.
Trucks, 110 ea.—\$156,897
- CLEVELAND PNEUMATIC TOOL CO., Cleveland, Ohio
Spare parts for various aircraft—\$80,135
- CONTINENTAL MOTORS CORP., Muskegon, Mich.
Automotive spare parts, replenishment—various—\$108,494
- CONTINENTAL MOTORS CORP., Muskegon, Mich.
Tracked vehicle replacement parts—717 ea.—\$49,573
- CONVAIR, GENERAL DYNAMICS CORP., San Diego, Calif.
Spare parts and training parts for F-106A and F-106B aircraft—\$51,570,000
- CURTISS-WRIGHT CORPORATION, Utica, Mich.
Repair parts for Diesel engines, various—4610 ea.—\$26,358
- DAYTON RUBBER CO., Dayton, Ohio
Tire, 8.25 x 20, 10 pr., T&B, Reg. Tread—1650 ea.—\$48,064
- DETROIT BEVEL GEAR DIV., NAPCO INDUSTRIES, INC., Detroit, Mich.
Automotive spare parts, replenishment—12127 ea.—\$77,734
- DETROIT DIESEL ENGINE DIV., GENERAL MOTORS CORP., Wayne, Mich.
Automotive spare parts, replenishment—3244 ea.—\$91,319
- DOUGLAS AIRCRAFT COMPANY, INC., Charlotte, N. C.
NIKE spare parts and components—\$129,514
- DOUGLAS AIRCRAFT CO., El Segundo, Calif.
Structural airframe spare parts—various—\$43,119

(Turn to page 130, please)



Wide range of premix moldings by the Plastics Division of General American Transportation Corporation includes: automotive air conditioning cabinet for O. A. Sutton Corp., Inc.; Silverstone portable TV cabinet for Sears, Roebuck and Co.; air duct and glove compartment for a leading automobile manufacturer; vending machine air duct for Vendo Co.

Premix moldings give you all three...quality, economy, versatility

Like to market better products and cut costs at the same time? Then premix moldings are for you!

When resins and reinforcing fibers are blended beforehand, more complex molds are not only possible but completely practical. Slots, grooves, holes, bosses and parts with varying wall thicknesses can be formed right in the mold. And whether the part is simple or complex, you'll get moldings with uniform strength and wall thicknesses. Premix moldings

are improving products and cutting costs for a wide variety of industries using strong, rigid, reinforced plastics.

Molders across the nation rely on Dow Vinyltoluene and Dow Styrene for top-quality premix moldings. They can help you to better products at lower costs. For the names of molders and suppliers, contact your nearest Dow Sales office or write to THE DOW CHEMICAL COMPANY, Midland, Michigan, Plastics Sales Dept. 2206H.

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serving new "Air Ride"

Chemiseal® NYLON PRESSURE TUBING

- **STRONG**
- **FLEXIBLE**
- **DURABLE**
- **ECONOMICAL**

This light, strong, flexible tubing meets stringent performance requirements at a fraction of the cost of metal tubing with required flexible couplings and intermediate fittings. And it is easier to install—saves assembly time. Available in 1000 psi and 2500 psi grades which conform to J.I.C. specifications for low and medium pressures.

Advantages include: high pressure rating at low cost; long flex and vibrational life; resistance to oils, greases, solvents; wide service temperature range; crush and abrasion resistance adaptability to standard metallic fittings.

Other feasible automotive applications are lubrication systems, fuel lines, oil lines, hydraulic systems.

For prompt service, contact one of The Garlock Packing Company's 30 sales offices and warehouses in the U.S. and Canada, or write

United States Gasket Company
Camden 1, New Jersey

**United
States
Gasket**

Plastics Division of
GARLOCK



(Continued from page 128)

DOUGLAS AIRCRAFT CO., INC., Santa Monica, Calif.

Repair parts for NIKE system—\$71,626
FIRESTONE TIRE & RUBBER CO., Los Angeles, Calif.

Tank, fuel aircraft—545 ea.—\$393,546
FISK TIRE DIVISION, UNITED STATES RUBBER CO., Detroit, Mich.

Tire, 9.00 x 16, SPR. T&B, M&S, ND—15,000 ea.—\$416,700
Tire, 9.00 x 20, T&B, ND, CC—15,670 ea.—\$519,049

FORD MOTOR CO., Washington, D. C.
Automobiles and station wagons—157 ea.—\$248,906

FORD MOTOR COMPANY OF CANADA, LTD., OVERSEAS DIV., Toronto, Canada

Automobiles and station wagons, 10 ea.—\$18,483

FORD MOTOR CO., Washington, D. C.
Light trucks—183 ea.—\$291,982
Trucks and buses—37 ea.—\$129,372

GENERAL ELECTRIC CO., Detroit, Mich.

Automotive spare parts, replenishment—35,202 ea.—\$80,071

GMC CHEVROLET MOTOR DIVISION, Detroit, Mich.

Automobiles, 5 passenger sedan—various qty.—\$39,944

GMC CHEVROLET MOTOR DIV., Detroit, Mich.

Trucks—various—\$702,182

GMC DELCO-REMY DIV., Anderson, Ind.
Battery, type 4H, 6 volt, dry and charged—1933 ea.—\$26,799

GMC FOREIGN DIST. DIV., New York, N. Y.

Light trucks, 9 ea.—\$16,885

GMC FOREIGN DIST. DIV., New York, N. Y.

Automobiles and station wagons, 15 ea.—\$21,864

GMC TRUCK AND COACH DIV., Pontiac, Mich.

Buses, 2 ea.—\$22,960

GENERAL MOTORS CORP., Flint, Mich.
Automotive spare parts replenishment—16,060 ea.—\$28,266

GENERAL MOTORS CORPORATION, Indianapolis, Ind.

Turbo prop engines—various—\$24,589.-600

GILFILLAN BROS., INC., Los Angeles, Calif.

Furnishing and delivering of depot replenishment repair parts for the corporal missile system—\$1,995,803

B. F. GOODRICH COMPANY, Dayton, Ohio

Fore and aft wheels for B-47 aircraft—\$1,105,780

Spare nose wheel assys. for C-131B, C, D, E aircraft—\$29,078

Wheel and brake assys. for H-37 aircraft—\$25,455

Spare parts applicable to aircraft—\$130,826

B. F. GOODRICH AVIATION PRODUCTS, A DIV. OF THE B. F. GOODRICH CO., Dayton, Ohio

Various spare parts for aircraft—\$69,766

Wheel assys.: nose landing gear—343 ea.—\$27,690

Spare wheels for B-47 aircraft—\$2,240.-112

Spare parts for C118A aircraft—\$120,313

GOODYEAR AIRCRAFT CORPORATION, Akron, Ohio

Nose sections, spare parts and data for the TM-76A missile

GOODYEAR TIRE AND RUBBER COMPANY, Akron, Ohio

Spare parts for aircraft—\$26,308

GOODYEAR TIRE AND RUBBER CO., Akron, Ohio

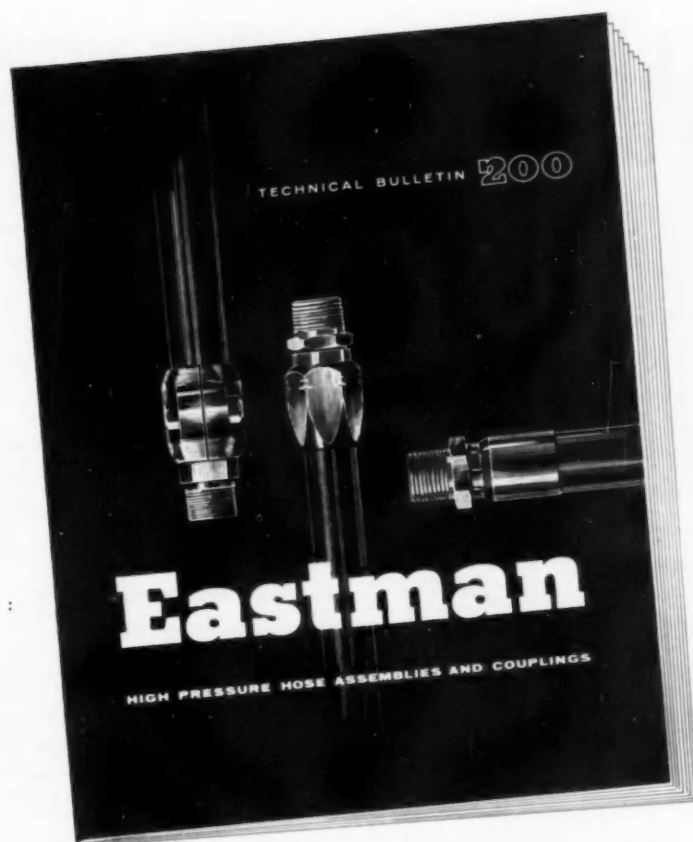
Lining: brake, used on brake assys. for various aircraft—various—\$80,942

GOODYEAR TIRE & RUBBER CO., Akron, Ohio

Tire, 11.00 x 20, 12 PR, ND, CC—21,544 ea.—\$1,150,234

Tire, 9.00 x 20, 8 PR, ND, CC—14,551 ea.—\$455,009

(Turn to page 132, please)



CONVENIENTLY ARRANGED TO HELP YOU MEET THE INCREASING DEMAND FOR HIGHER PRESSURES

Here's an entirely new service concept in catalog arrangement. It is designed to assist Engineers and Purchasing Agents in specifying Multi-Braid Hydraulic Hose and Tube Assemblies to meet the demand for increasing pressure requirements. With pressure as a primary consideration—the right assembly can be selected for the specific equipment on which it is to be used.

Nine major sections are devoted to assemblies suited to all types of high pressure hydraulic applications—complete with tables and specifications, including easy to read dimensional cross section drawings.

Include this new catalog in your files to make it easier to specify the proper assemblies.

Write for Your Copy Today!



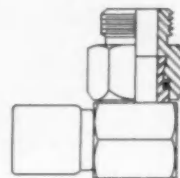
MANUFACTURING COMPANY
Dept. AI-7, MANITOWOC, WISCONSIN

SAFEGUARDING AMERICA'S LIFELINES OF MOBILE POWER

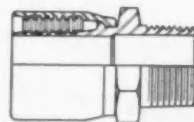
AUTOMOTIVE INDUSTRIES, July 15, 1953

AN INSIDE LOOK AT A *NEW BOOK*

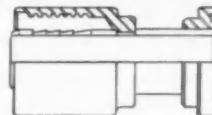
Eastman's new Technical Bulletin offers a new standard in simplified arrangement—for your convenience in specifying—according to your pressure requirements.



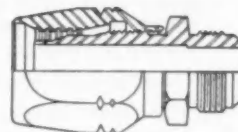
Swivel "O" Ring Male Couplings are available in 45° and 90° angles. Specifications on Page 13.



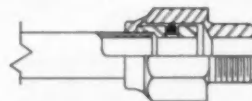
Permanently Attached Couplings for z-wire braid hose. Specifications and Details on Page 10.



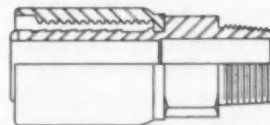
Permanently Attached Flange Head Couplings and Inserts from 0° to 90°. See complete list on Page 21.



2-Piece Reusable Couplings for all high pressure hose. Used for pressures up to 5000 lbs. See Page 25.



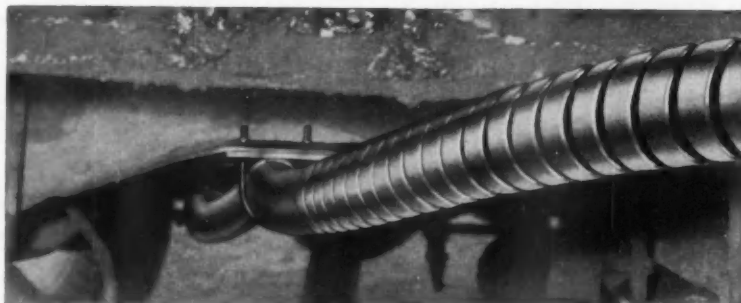
Swivel Male Tube Nut "O" Ring Assembly used on formed tubing—described on Page 30.



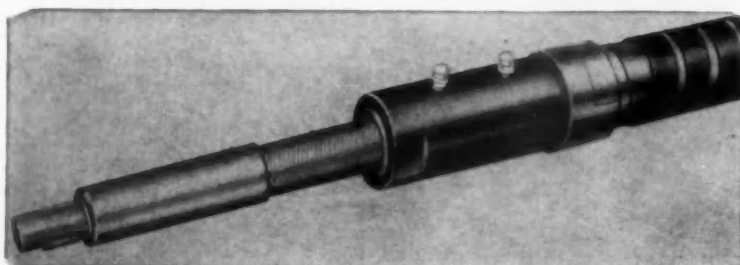
Permanently Attached Couplings for Extreme High Pressures up to 7000 lbs. working pressure, Page 12.

STOW FLEXIBLE SHAFTING

The Ideal PTO Drive



1 1/4" flexible shaft under tractor-trailer transmitting 10 HP.



1 1/4" core assembly pulled out of casing. Note steel-backed bronze sleeve bearing.

Here are five big reasons why flexible shafting is an ideal power take-off drive on trucks and tractor trailers.

FLEXIBLE SHAFTING:

1. Can connect a drive shaft and a driven shaft which are working at different angles and located in different planes.
2. Eliminates the need for accurate alignment.
3. Eliminates dangerously exposed revolving parts; no safety guards required.
4. Replaces connections affected by vibration.
5. Is economical because it is so easy to install and maintain.

Available with built-in bearings and couplings in sizes from 1/4 inch to 1 1/4 inches in diameter—STOW flexible shafting can help solve your trucking and maintenance problems in advance. The know-how of 82 years' experience goes into every STOW flexible shaft!

STOW flexible shafts are being used on trucks and tractor-trailers to:

- Operate pumps for petroleum, other liquids and hydraulic pumps on dump trailers.

- Operate conveyors for grain and coal.

- Operate compressors on refrigeration trucks.

Our Engineering Department will be glad to work with you on any special drive problems. For complete data on flexible shafting sizes, torque capacities, and other specifications, write for STOW Engineering Bulletin No. 570, and Tractor-Trailer Bulletin No. 542.



STOW MANUFACTURING CO.

393 Shear St.

Binghamton, New York

(Continued from page 130)

GRAND CENTRAL ROCKET CORP., Redlands, Calif.
Dart, rocket motors and igniters—\$60,514

HOLLEY CARBURETOR CO., Detroit, Mich.
Automotive spare parts, replenishment—9173 ea.—\$206,301

HOLLEY CARBURETOR CO., Warren, Mich.
Automotive spare parts, replenishment—1800 ea.—\$40,374

HOOVER ELECTRIC COMPANY, Los Angeles, Calif.
Actuators: For FJ-4, 4B aircraft—118 ea.—\$72,098

INTERNATIONAL HARVESTER CO., Washington, D. C.
Trucks and buses, 4 ea.—\$23,357
Buses, 6 ea.—\$25,481
Light trucks, 9 ea.—\$12,790

LEE RUBBER & TIRE CORP., Conshohocken, Pa.
Tire, 9.00 x 20, 12 ply, R&B, ND—3600 ea.—\$157,572
Tire, pneu., 10.00 x 24, 12 PR, T&B, M&S, Tread—440 ea.—\$35,301

MARTIN CO., Baltimore, Md.
Spare parts support P5M-2 aircraft various—\$59,933

MOHAWK RUBBER CO., Akron, Ohio
Tire, pneu., 18.00 x 24—300 ea.—\$88,020

NORTH AMERICAN AVIATION, INC., Canoga Park, Calif.
Rocket engines—\$2,706,500

OLIVER CORPORATION, Charles City, Iowa
Tractor, wheeled, industrial type, size 3, 12 ea.—\$26,417
Tractor, wheeled, industrial type, size 4, 12 ea.—\$25,479
Tractor, wheeled, GED, 12 ea.—\$27,326

PIQUETTE INDUSTRIES, Detroit, Mich.
Automotive spare parts, replenishment—3644 ea.—\$37,807

RAY WHYTE ELECTRIC PRODUCTS, Centerline, Mich.
Automotive spare parts, replenishment—\$38,424

SCINTILLA DIV., BENDIX AVIATION CORP., Sidney, N. Y.
Accessory spare parts for various aircraft—\$29,414

SUNDSTRAND MACHINE TOOL COMPANY, Rockford, Ill.
Transmission and governor assys. (Support of RF-101C and F-1-1B aircraft)—\$1,603,440

TOWMOTOR CORP., Cleveland, Ohio
Trucks, lift fork, gasoline powered, types IV and III, 4000 and 6000 lb. capacity, 87 ea.—Technical Data, 3 lots—\$337,970

UNITED AIRCRAFT CORP., Windsor Locks, Conn.
Starter, pneumatic, aircraft engine type M-5 for B-58 series aircraft—\$29,460

UNITED MOTORS SERVICE DIV., GENERAL MOTORS CORP., Detroit, Mich.
Automotive spare parts, replenishment—47,165 ea.—\$215,864

UNITED STATES RUBBER CO., Detroit, Mich.
Tire, 9.00 x 16, 8 PR, T&B, M&S, ND—7170 ea.—tire, 6.00 x 16, 6 PR, Lt. Trk., M&S, ND—6280 ea.—\$267,006

VERSON ALLSTEEL PRESS CO., Chicago, Ill.
Press brake, hydraulic, capacity 5 ft. by 1/2 in.—5 ea.—\$96,050

WESTERN ELECTRIC CO., INC., New York, N. Y.
NIKE spare parts and components—\$1,489,815

WILLIAM R. WHITTAKER CO., LTD., Los Angeles, Calif.
Spare parts for C47 and C117 series aircraft—\$68,403

WILLIS MOTORS INC., Toledo, Ohio
Trucks, 40 ea.—\$93,178

WILLIS MOTORS, INC., Toledo, Ohio
Firm fixed price contract for miscellaneous commercial spare parts for Willis type commercial vehicles—\$505,568

NEW FROM DU PONT RESEARCH

Remarkable resistance to ozone, aromatic fuels, and "sour gas" shown by new **FAIRPRENE**[®] diaphragm material

Now, Du Pont announces the development of a new "Fairprene"[†] coated fabric for diaphragms. This new material shows remarkable resistance to swelling and deterioration in aromatic fuels, "sour gas" and under high ozone conditions—retains its properties from -65°F.

For further information about these "Fairprene" ozone and aromatic fuel resistant diaphragm materials mail the coupon below or write: *E. I. du Pont de Nemours & Co. (Inc.), Fabrics Division, Dept. AI-87, Wilmington 98, Delaware.*

CONSTRUCTIONAL AND PHYSICAL PROPERTIES^{††}

Quality No. FABRIC BASE	22-005FO NYLON	21-009FO COTTON	22-006FO NYLON
Thickness	.013"	.013"	.050"
Tensile Strength—Lbs./Inch, Min.	75 x 75	80 x 80	300+ x 300+
Tear Strength—Lbs., Trap., Min.	2 x 2	2 x 2	25 x 25
Burst Strength—PSI, Mullens, Min.	125	125	500
Ozone Resistance at 60 Parts Per Million*	OK 208 Hr.	OK 208 Hr.	OK 208 Hr.
Fuel Resistance—Volume Change after 72 Hrs. at Room Temp. in ASTM High Aromatic Fuel**	+3.3%	+9.4%	+20.9%

*Ordinary diaphragm materials fail in 15 minutes under this test.

**Ordinary diaphragm materials swell about 20% under the same conditions.

††The above data are based upon tests on production experience and should not be used as specifications.

DU PONT
INDUSTRIAL COATED FABRICS
SHEET STOCKS • CEMENTS



BETTER THINGS FOR BETTER LIVING... THROUGH CHEMISTRY

AUTOMOTIVE INDUSTRIES, July 15, 1958

†"Fairprene" is Du Pont's registered trademark for its coated fabrics, sheet stocks and cements.

► Mail coupon for free sample of new "Fairprene" ozone and aromatic fuel-resistant diaphragm material . . .

E. I. du Pont de Nemours & Co. (Inc.)
Fabrics Division, Dept. AI-87, Wilmington 98, Delaware

☐ Please send free sample of new "Fairprene" diaphragm material with high ozone and aromatic-fuel resistance.

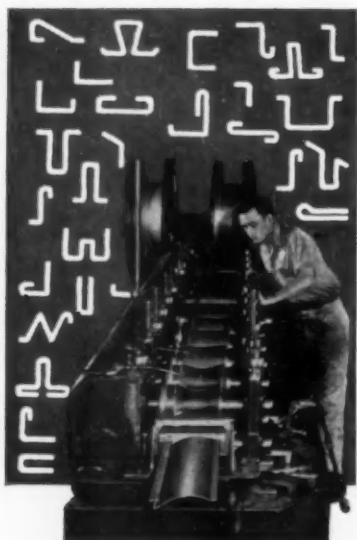
☐ Please send bulletin on "Fairprene" industrial coated fabrics.

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Company _____

Address _____

City _____ Zone _____ State _____



With a YODER... ONE MAN PRODUCES 30,000 FEET OF SHAPES A DAY!

Cold-roll forming with a Yoder Roll-Forming machine makes spectacular production possible in many metalworking applications and industries.

A multitude of shapes, simple or complex, produced from a wide variety of coated or uncoated stock, and destined for a virtually endless list of purposes, can be easily, quickly and economically produced with a Yoder cold-roll forming machine.

Whether it be moldings, structurals, siding, roofing, tubulars, cabinet shells, or any one of a thousand requirements, it can be quickly produced with accuracy and uniformity the Yoder way. The conversion cost is usually so low that even part-time operation makes a Yoder cold-roll forming line a profitable investment.

A great many modifications of the basic shape such as welding, coiling, ring forming, notching, perforating, embossing and cutting to length, can be simultaneously introduced with little or no additional labor cost. It will pay you big dividends to fully investigate the advantages of Yoder cold-roll forming. A fully-illustrated, 88-page book clearly discusses every important aspect of this amazingly versatile method of metal fabrication... it is yours for the asking.

THE YODER COMPANY
5553 Walworth Ave. • Cleveland 2, Ohio



Airline estimates indicate that 30 per cent of all traffic will be flying in turbine-powered aircraft by the end of 1959 and that the new jets will be the basic airline aircraft by 1961.

Civil Aeronautics Administration predicts that by 1965, domestic volume will reach 83 million passengers, almost twice the amount carried in 1957.

The profit margin for domestic trunk airlines was 1.9 per cent in 1957, compared with 7 per cent in 1952.

Since 1938, the average revenue per passenger mile has gone down from 5.32 cents to 5.25. Dur-

ing that same time, overall living cost went up 98 per cent, bus tickets went up 37 per cent, and rail freight rates went up 46 per cent.

A single rocket engine produces the power equivalent to 35 locomotives.

To keep a steel exhaust deflector on a rocket engine test stand from melting, 30,000 gallons of water are used during a 60 second engine run.

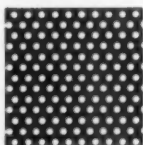
A rocket-powered test sled weighing seven tons will move 1700 mph—faster than a bullet fired from a rifle.

In 1957, average gross hourly earnings in the automobile manufacturing industry were \$2.45. This was nearly 12 per cent higher than average earnings in all durable goods manufacturing, nearly 19 per cent higher than the average for all manufacturing companies, and 30 per cent higher than the average for total non-durable goods manufacturing.

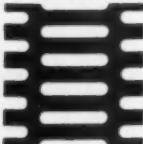
H&K PERFORATED MATERIALS

for Industrial or Decorative Uses

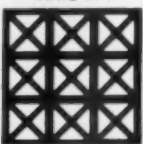
THOUSANDS
OF
DIFFERENT
PATTERNS
AVAILABLE



Round holes



Oval holes



Decorative patterns

H & K facilities enable the perforating of all metals, wood, plastics and cloth fabrics. Perforated materials can be furnished in sheets, coils, rolls or plates. Fabricating services include shearing, rolling, welding and forming.

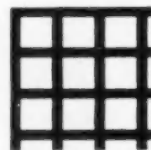
Perforated metal can be ordered with special finishes: aluminum—color anodized or brushed and lacquer finish; steel—painted, chrome plated, enameled, japanned or other baked-on finish. Decorative patterns can be embossed if requested.

Many patterns in steel sheets (industrial or decorative) are in stock at our warehouses. Send for H & K Stock List Brochure.

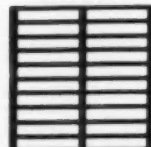
Write to nearest H & K office today—for General Catalog

THE Harrington & King PERFORATING CO. INC.

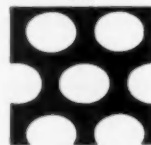
Chicago Office and Warehouse • New York Office and Warehouse
563 Fillmore Street 106 Liberty Street
Chicago 44, Illinois New York, New York



Square holes



Slots



Oval holes

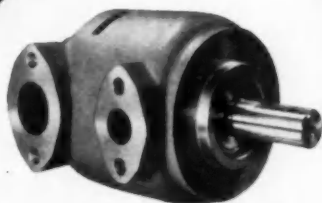


Listed Under
"Perforated Metals"

POWER UP...

with **DENISON** hydraulic equipment...

CATERPILLAR did!



2000 PSI HYDRAULIC POWER

...for operating Caterpillar's rugged No. 9 Ripper is delivered by a single Denison "T" series vane pump. Payoff: jobs get done with troublefree power to spare for toughest workloads.

• Why? Because dependable 2000 psi Denison hydraulic power helps Caterpillar build *lower operating cost* and *continuous, troublefree performance* into its rugged earth-moving units.

Case in point: Here's Caterpillar's No. 9 Ripper — another of many construction units to be factory-equipped with Denison hydraulic equipment. The Ripper's hardworking teeth are *powered by a single Denison vane-type pump* which provides plenty of reserve "go" for toughest workloads.

Plus benefits: All-weather pump starting without pump damage . . . speedy field servicing . . . less weight . . . less cost-per-horsepower—with a Denison pump as the heart of a hydraulic system.

Caterpillar picks Denison hydraulic equipment for reliability . . . quality . . . proven field performance. It pays off in helping keep Cat® units operating continuously . . . profitably month after month.

It's the kind of job your Denison Hydraulic Specialist can help you do now. Ask him more about how Denison hydraulic power . . . up to 5000 psi . . . can *improve performance of your equipment.*

DESIGNERS—ENGINEERS!

Write for your copy of Bulletins 200 and 201—"How to Design More Efficient Hydraulic Power Into Mobile Machinery" and "Balanced Vane 2000 psi Hydraulic Pumps".



DENISON ENGINEERING DIVISION

American Brake Shoe Co.

1212 Dublin Road • Columbus 16, Ohio

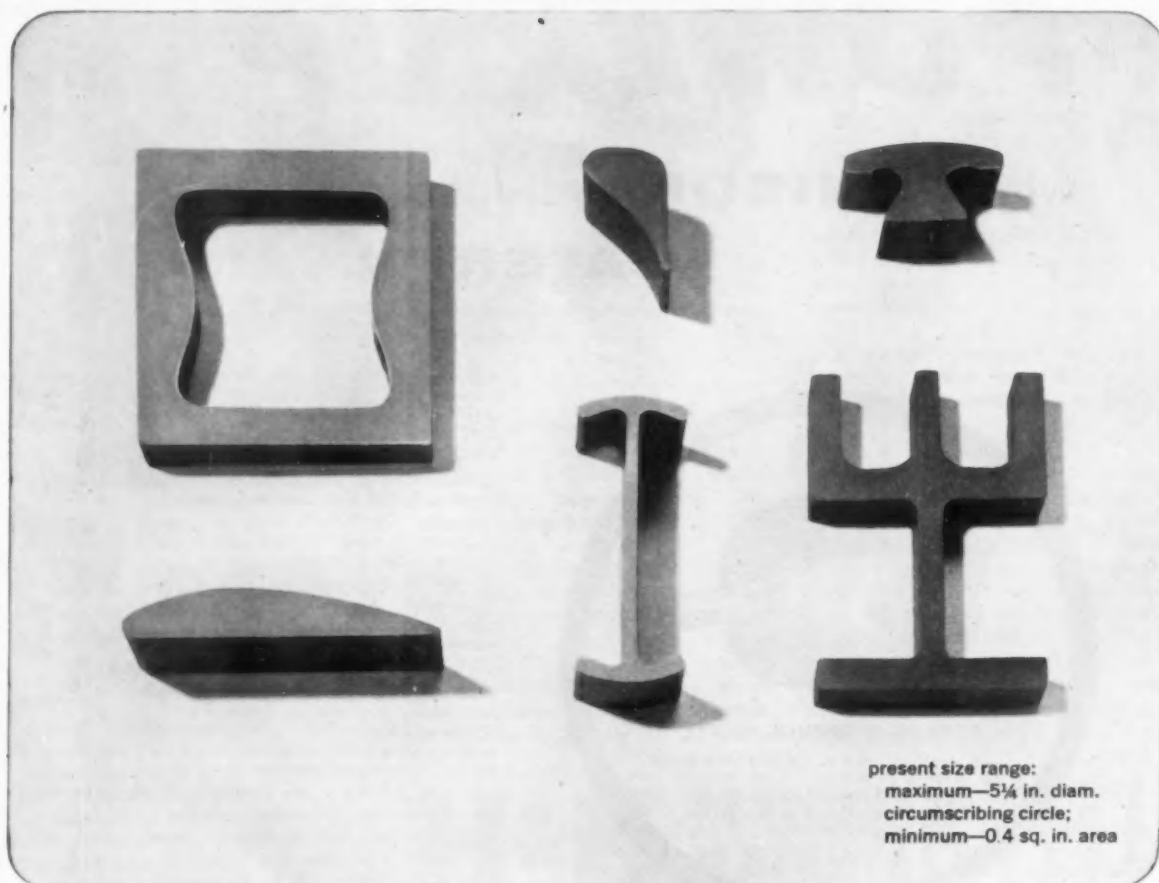


HYDRAULIC PRESSES • PUMPS • MOTORS • CONTROLS

Denison and Denison Hydraulics are registered trademarks of Denison Eng. Div., ABSCO



Experience—the added alloy in A-L Stainless, Electrical and Tool Steels



• 321 Stainless
• 410 Stainless

• 405 Stainless
• SAE 1020

• 304 Stainless
• SAE 4340

Here's how highly intricate steel extrusions from Allegheny Ludlum help you cut costs

Allegheny Ludlum Extrusions can help you cut costs, save money. If you are now rolling, casting or machining steel parts like these, consider the cost-cutting features inherent in extruding metal, already proved by non-ferrous extrusions during the last 10 years.

A-L high-quality Steel Extrusions can save you money on four very important counts. (1) Orders are taken in quantities as small as 40 pounds. No large tonnage rolling requirements. (2) Charge for die design is low—under \$200. No expensive rolls to cut. (3) Machining costs are slashed to a minimum; there's no waste of material. (4) Extruding

saves time from the order to availability of finished parts.

There is no limit to what steels can be extruded. Allegheny Ludlum works everything from all stainless grades to carbon and electrical steels, high temperature alloys, nickel alloys and even metals such as zirconium.

Prove to yourself that extruding steel can save you money. Write for Allegheny Ludlum's 12-page technical bulletin, full of process explanations, material properties, design tips, etc. Or contact your nearest A-L office for technical assistance.

Allegheny Ludlum Steel Corporation, Oliver Bldg., Pittsburgh 22, Pennsylvania. Address Dept. AI-7.

ALLEGHENY LUDLUM

for warehouse delivery of Allegheny Stainless, call RYERSON

Export distribution: AIRCO INTERNATIONAL

EVERY FORM OF STAINLESS . . . EVERY HELP IN USING IT



WSW 7120



HOW TIMES AND TOOLS HAVE CHANGED!

IT COST US A **NEW CP
UNIVERSAL
ELECTRIC**

TO RETIRE THIS 50 YEAR

OLD VETERAN



The CP Electric Drill made in 1908 was still on the job until we swapped a brand new CP tool just to get our hands on it. Only the styling has changed. Today the ability of CP Hicycle, Super Cycle and Universal Electrics to perform for a half-century or more remains unchanged! Note how the new CP 903-R Electric Impact Wrench keeps in tune with the times . . . 2" profile to get into the tight spots dictated to by modern space-saving designs . . . the centered pistol grip with reverse switch in handle for simple, one-hand operation. And the CP 903-R delivers 2000 blows a minute — has built-in bonus capacity, rated for $\frac{3}{8}$ " bolt size, handles $\frac{5}{8}$ " readily.



Chicago Pneumatic

8 East 44th Street, New York 17, New York

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES



KELSEY-HAYES POWER BRAKES

Now Offered

as standard or optional equipment

by America's Leading
Producers of Motor Cars

Power braking systems are just one of many diversified products manufactured by Kelsey-Hayes for the automotive industry—one of several major industries served by Kelsey-Hayes Company, Detroit 32, Mich.

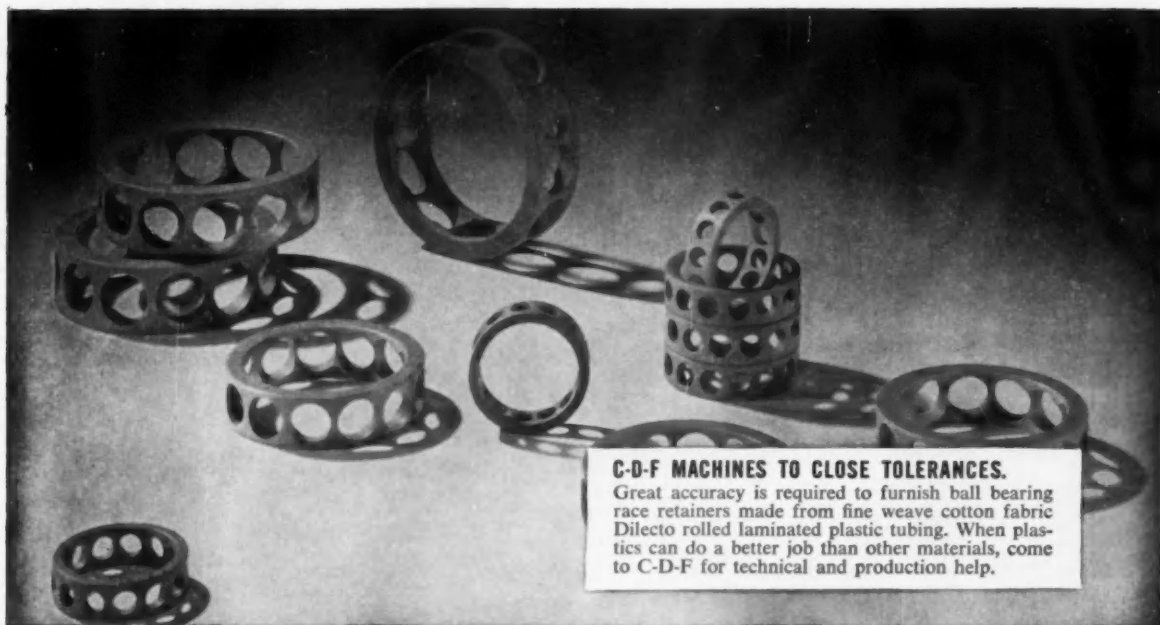


KELSEY-HAYES



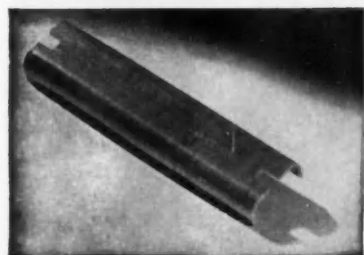
Automotive, Aviation and Agricultural Parts • Hand Tools for Industry and Home

28 PLANTS: Detroit and Jackson, Michigan; Los Angeles; McKeesport, Pa.; Springfield, Ohio (Speco Division); Utica, New York (Utica Drop Forge & Tool Division); Davenport, Iowa (Farm Implement and Wheel Division); Philadelphia (Heintz Division); Clark, New Jersey (New Jersey Division); Windsor, Ontario, Canada.

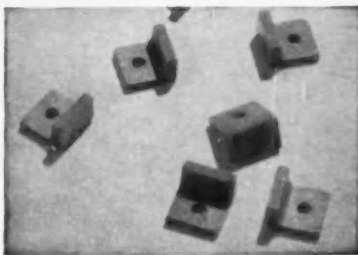


C-D-F MACHINES TO CLOSE TOLERANCES.

Great accuracy is required to furnish ball bearing race retainers made from fine weave cotton fabric Dilecto rolled laminated plastic tubing. When plastics can do a better job than other materials, come to C-D-F for technical and production help.



C-D-F PIONEERED IN POST-FORMING of laminated plastics. This technique gives you stronger, more versatile insulating parts with lower costs. This aircraft channel strip is an example of simple post-forming.

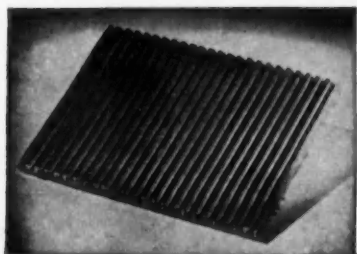


C-D-F DOES THE UNUSUAL. These rubbing blocks are made from fine-weave cotton cloth Dilecto molded tubing that has been pierced and cut. The part gains in mechanical strength — the product gets longer service life.



C-D-F SPECIALIZES IN AUTOMATIC SCREW MACHINING of plastic components. These breaker arm bushings are made from Dilecto paper base rolled tubing on high speed machines by men who know and use cost saving methods.

Yes, C D F is a big reliable source for fabricated plastics!



C-D-F SERVES MANY INDUSTRIES with fabricated specialties. A great amount is concentrated in the automotive and allied fields. This aircraft part has a corrugated surface on a strong woven asbestos laminated base.



C-D-F IS A PUNCHING SPECIALIST on these starter solenoid insulators. This is XX-26 Dilecto molded channel strip, pierced and punched to length. Special C-D-F punching grades give you lower costs, faster assembly, fewer rejects.



C-D-F COMES UP WITH THE ANSWERS to insulating problems. These unique snap-in grommets are easy to insert, spring out and hold tight. Write for samples. The chances are that C-D-F is already making the answer to your problem.

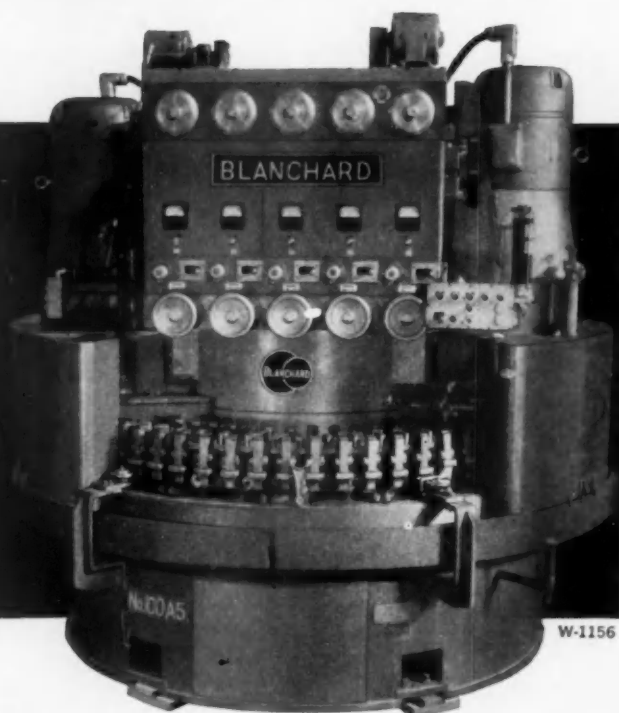
See our general catalog in Sweet's Design File for more technical data, the address and telephone number of your nearest C-D-F sales engineer. Also, write for detailed information, samples, or send us your print for quotation.



CONTINENTAL-DIAMOND FIBRE

A SUBSIDIARY OF THE *Buhl* COMPANY • NEWARK 2, DEL.

**For mass production
grinding
at lowest unit cost...
Blanchard Center Column
Surface Grinders**



W-1156

For long-run work at high production rates, it's just plain good economic sense to grind flat surfaces on the Blanchard. These automatic multiple-spindle machines are widely used in the cost-conscious automotive industry for close-tolerance grinding from the rough castings or forgings. Time-saving Blanchard fixtures allow a single operator to handle large quantities of parts every shift.

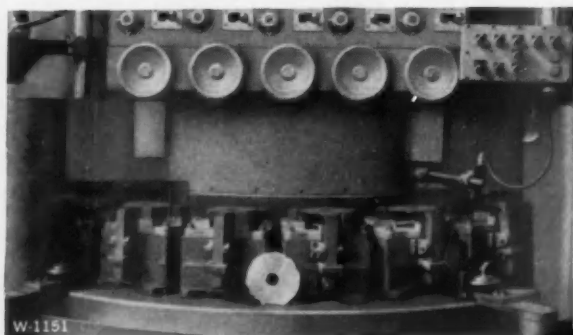
Blanchard Center Column Grinders are available with three, four or five grinding spindles and 80", 90" or 100" O.D. work tables to handle a wide variety of parts. The No. 100-A5 is shown.

New functional design, with minimum floor space, provides several advantageous features.

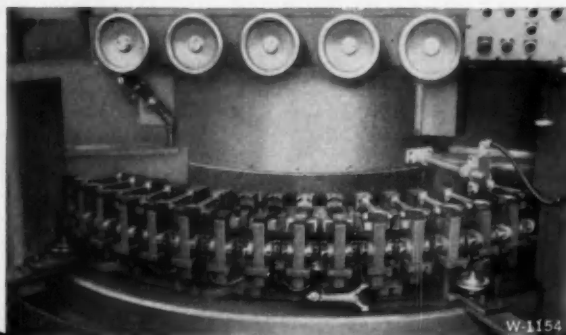
Sludge disposal is automatic to coolant reservoir... power rapid traverse on each head speeds wheel changes. Wheels are easily reached through separate doors from the floor. Centralized lubrication... all operating controls are easily accessible, with complete safety features for operator and machine protection... large loading-unloading area. These and other features result in better grinding jobs in less time—and at less cost—when you Put It On The Blanchard.

Send for illustrated folder No. 374 which describes the 3 models of the Center Column machines in detail.

Typical Grinding Jobs Performed on the Blanchard Center Column Grinder:



Front Pump Cover. MATERIAL: Cast Iron. STOCK PER SIDE: $\frac{1}{16}$ " to $\frac{3}{32}$ ". NO. OF SIDES GROUND: One. LIMITS: Must be flat within .002". PRODUCTION: 360 pieces per hour (net). These pieces are ground in a 20 station fixture, on a No. 100-A5 Blanchard.



Connecting Rods. MATERIAL: Steel forging. STOCK PER SIDE: $\frac{1}{32}$ ". 1st OPERATION: Grind 2 sides and 2 ends. LIMITS: $\pm .001$ ". NO. OF SIDES: 2. PRODUCTION: 600 per hour, 1200 surfaces (net). These pieces are ground in a 60 station fixture, on a No. 100-A5 Blanchard.

BLANCHARD

THE BLANCHARD MACHINE COMPANY 64 STATE ST., CAMBRIDGE 39, MASS., U. S. A.



ARTIST'S INTERPRETATION

There is no substitute for stainless steel
in outer space

From the intense cold of outer space to the heat of a jet engine, Stainless Steel is the one metal that will stand up. In rockets, missiles and supersonic aircraft, Stainless Steel resists heat, friction and corrosion, has a high strength to weight ratio and maintains its structural integrity under the most severe conditions.

Specify McLouth high quality sheet and strip Stainless Steel. McLouth Steel Corporation, Detroit 17, Michigan.

Mc LOUTH STAINLESS STEEL

LEAKPROOF?



Be sure with **INLAND** *Self-Sealing Weather Strip*

Windshields and "fixed" windows can be leakproof—even under extreme conditions—by simply designing, or specifying Inland Self-Sealing Weather Strip.

Inland Self-Sealing Weather Strip needs no special mounting surface, channels, moldings, or binders. One man can

install with a minimum of time, effort, materials. Inland Weather Strip is made in a wide variety of standard shapes and sizes . . . or to your specifications for any installation or service requirement. Get complete details on Inland Self-Sealing Weather Strip now.



Body panel is first fitted into strip. Glass is next fitted into the strip. Then, over-size filler strip is "zipped" into locking channel which expands and compresses the whole weather strip into one complete, permanent, leakproof seal.



INLAND MANUFACTURING DIVISION
General Motors Corporation • Dayton, Ohio

INLAND SELF-SEALING WEATHER STRIP IN ACTION



Transportation Industry



Railway Equipment



Marine Applications



Automotive Installations



Over-the-road Equipment



Commercial Structures

**The Most Advanced Power Plants
For Over-The-Road Operations!**



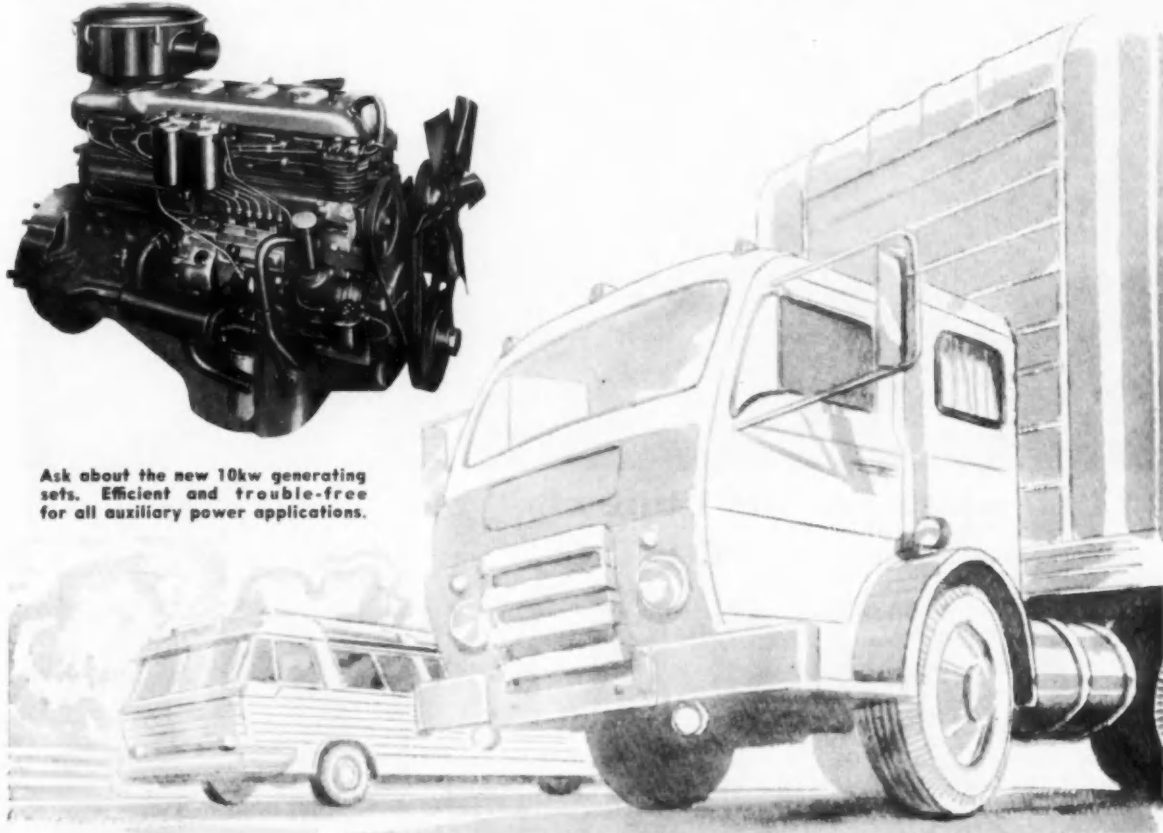
MERCEDES-BENZ DIESEL ENGINES

In all types of over-the-road operations, Mercedes-Benz diesel engines make possible lower operating costs, increased payload capacities, superior road performance and far less off-the-road time for servicing and repairs . . . Because of their ultra-modern design, Mercedes-Benz diesels deliver more horsepower per pound of weight—keep cargos rolling at

minimum cost . . . You get economical fuel consumption, quiet operation and smokeless combustion, along with an unusually long operating life . . . To the man behind the wheel, Mercedes-Benz means power 'plus' to meet his every need. If you demand the very best—specify a Mercedes-Benz diesel . . . Models available to meet your requirements.



Ask about the new 10kw generating sets. Efficient and trouble-free for all auxiliary power applications.



Other Mercedes-Benz diesels available in 12 and 20 cylinders, Turbo and Supercharged, up to 3000 h.p.

UTICA DIVISION
CURTISS-WRIGHT
CORPORATION • UTICA, MICHIGAN





1,001 parts for 1,001 uses!

another example of **ORCO**

CUSTOMEERING

Every component molded at Ohio Rubber—whether from rubber, synthetic rubber, silicone rubber, polyurethane or flexible vinyl—varies in its application and functional requirements. From the smallest parts to those involving molds up to 32" x 100" in over-all area ORCO CUSTOMEERING assures component uniformity and quality in meeting the most exacting specifications.

Check with ORCO engineers on your next rubber or vinyl component problem whether molded, extruded, or bonded to metal. Find out how ORCO research, design, electronically controlled mixing and production facilities can go to work for you in "customeering" your particular component.



Send for
free booklet
"Component
CUSTOMEERING
rubber and vinyl parts".



THE OHIO RUBBER COMPANY

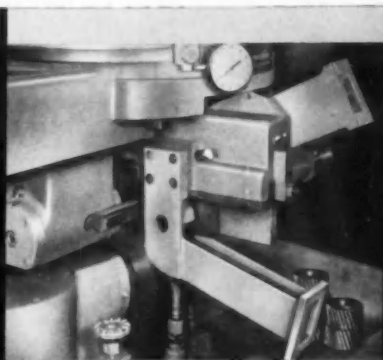
WILLOUGHBY, OHIO

A DIVISION OF THE EAGLE-PICHER COMPANY

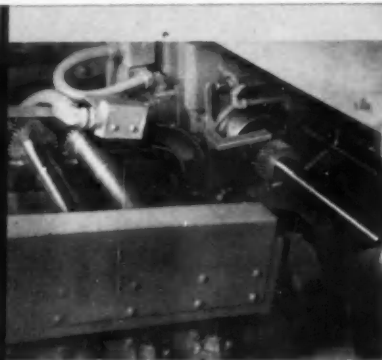




INTERNAL 870-C, only vertical internal shaver where a heavy mass (chuck and gear) drives the cutter. Reversals impose no abnormal loads on cutter teeth. This prevents excessive cutter breakage. Extras—plunge shaving.



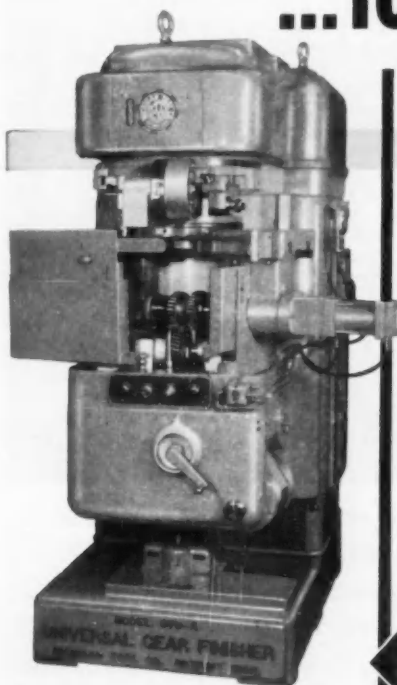
UNDERPASS 870 Gear Finisher for fastest shaving—long or short run—of spur, helical, herringbone or shoulder gears. Extras—the new knee, new cutter-saving drive, crowning cutters, easy to set up and operate.



READILY AUTOMATED—Michigan 870 and 870-A shavers can be partly or fully automated. They are the only vertical shaving machines featuring 'straight-through' automation. They can be automated to load or unload from front or back.

TO GET BETTER GEARS AT LOWER COST

...look for the extras



Michigan's latest 870-series Gear Finishers are loaded with EXTRAS. A new knee assembly brings all controls to the front—and puts the operator closer to the work. Operators like ease of setup, vernier and dial locating, and the simple locking. Work located above cutter makes manual loading safer, automatic loading easier. Machine ways are up out of the way of contamination by chips or foreign matter. Timken bearings, extra-rugged fully splined shafts and a shock-absorbent drive, provide a sturdy no-backlash drive. Starts and stops are cushioned to keep cutters operating longer. Every installation has the EXTRA of being individually Michigan Application Engineered to cut costs.

Write for descriptive literature.

UNIVERSAL 870-A (with new knee) permits adjustable automatic upfeed to be used with any of the three basic shaving methods. Extras—faster approach, longer tool life. Optional crown shaving attachment (permits shaving of a series of gears with varied crowns using only one tool).

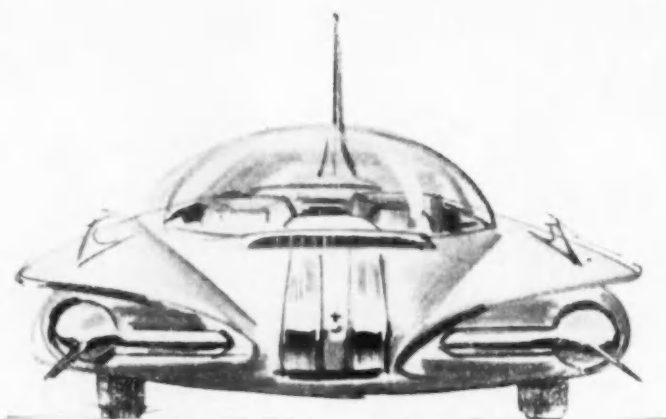
May we have the Michigan Tool engineering representative in your area show you how Michigan gear finishing can make your geared parts even better.



**MICHIGAN TOOL
Company**



7171 E. McNICHOLS RD., DETROIT 12, MICH., U.S.A.
IN CANADA: COLONIAL TOOL CO. LTD.



PUROLATOR'S DRY TYPE AIR FILTERS GIVE

COMPLETE DESIGN FREEDOM



With Purolator's new dry type air filters, there's no need to keep a constant, level bearing . . . to set the air cleaner on top of the block. There is no oil to spill, no level to be maintained. This makes it possible to place the filter anywhere at all . . . under the engine, on the side . . . wherever it allows the most design freedom.

Of course, the big advantage in dry type filtration is

the optimum efficiency it affords. The Micronic dry type element is just as effective at low speeds as at high speeds. And instead of becoming less efficient with use, its already outstanding 99% efficiency *increases* to 99.7%.

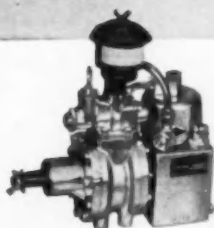
Design your cars the way you want them . . . then call on Purolator to design and produce the air filter to fit your design.

Filtration For Every Known Fluid

PUROLATOR
PRODUCTS, INC.

RAHWAY, NEW JERSEY AND TORONTO, ONTARIO, CANADA

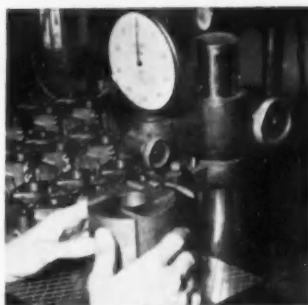
Rigid quality control
in manufacturing the
Wagner
ROTARY
AIR COMPRESSOR
and other air brake
components improves operating
efficiency and service life



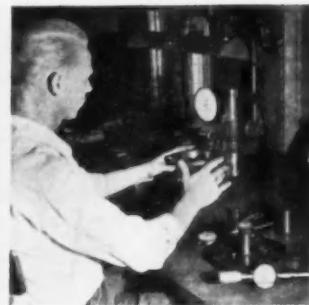
The superior operating features of Wagner Rotary Air Compressors are directly related to Wagner's Rigid Quality Control manufacturing program—an important reason owners have so little trouble when the compressors are put into operation. At the factory every unit must pass careful inspection and run-in tests to assure that each compressor provides an adequate supply of air pressure at all times, with fast air recovery; and can provide safe, dependable performance and long service life.

If service should be needed—the entire compressor can be completely disassembled, serviced and put back into operation in a few hours. There are Wagner factory service branches in 23 major cities and a vast network of Wagner Air Brake Distributors throughout the United States and Canada to give prompt and efficient service on any air brake need.

It will pay you to include Wagner Air Brake Systems as standard equipment on the vehicles you manufacture. For further information, send for a copy of Bulletin KU-201.



1. Accurate machining assures the smooth, cool operation of the Wagner Rotary Air Compressor. Close dimensions on all planes of the rotor eliminate vibration . . . permit compressor blades to function smoothly at high speeds.



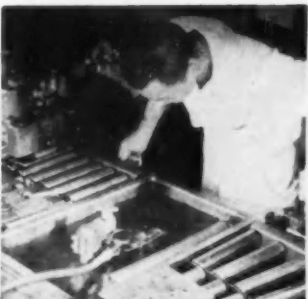
2. Accurate machining and gauge testing of the rotor, as well as the rotor, also contributes to the rotary compressor's ability to operate for long periods of time without developing leaks or losing efficiency.



3. Compressor shafts are given the "cold box" treatment. When exposed to very low temperatures, the shaft diameter contracts. This altered shaft diameter allows proper insertion into a heated rotor to form a strong, composite unit.



4. Compressor rotors are subjected to high oven temperatures to expand rotor diameters. Shafts and rotors joined together under these extreme conditions resume their original relative size to create an extra strong assembly.

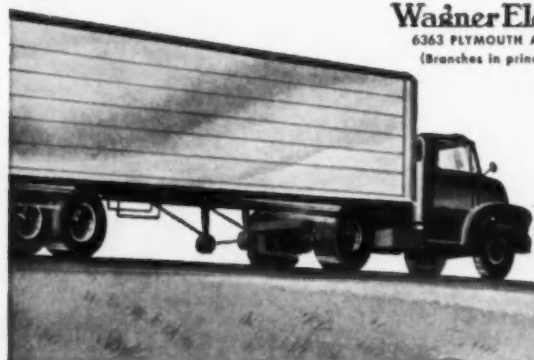


5. Assembled rotary compressors are hooked up to air lines and operating air pressure is applied for leakage tests. While holding pressure, entire compressor is submerged to determine whether any air is escaping.



6. Every Wagner Rotary Air Compressor is given a rigorous "run-in" test to determine its resistance to overheating and its over-all performance. Running temperatures, vibration, noise and air output are carefully noted and analyzed.

WK58-1A



Wagner Electric Corporation

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(Branches in principal cities in U.S. and in Canada)

The complete Wagner Air Brake Line includes many types and kinds of equipment—all fully described in Catalog KU-201. Write today for your free copy.



LOCKHEED HYDRAULIC BRAKE PARTS, FLUID and BRAKE LINING • AIR HORNS • AIR BRAKES • TACHOGRAPHS • ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES

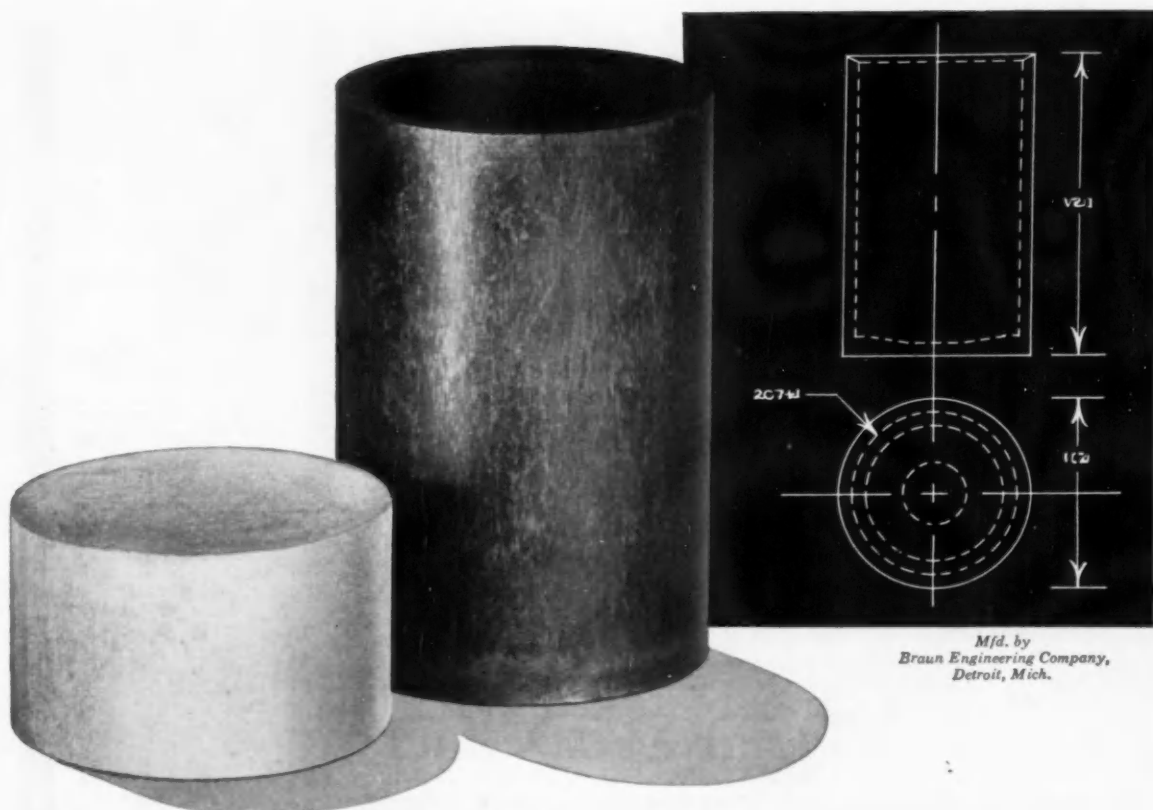
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LARGEST AND MOST MODERN
PRODUCTION FOUNDRIES

ESTABLISHED 1866

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MAIN OFFICE AND MANUFACTURING PLANTS
CHATTANOOGA 2, TENNESSEE



EXTRUDED...and sold for less than the raw stock used to cost!

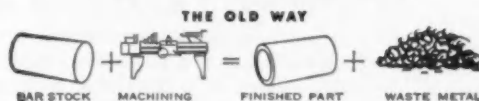
Cold extrusion of steel means big reductions in material, machinery, and time. Frequently, as in the case of the automotive motor mount above, the part is made by cold extrusion for about the cost of the raw metal used in conventional methods.

More and more, manufacturers are turning to cold extrusion as a cost cutting, simplified method of making quality parts. Machining is cut to a bare minimum and scrap virtually disappears. "Impossible" jobs are being mass produced at high rates and a lot of the "impossibles" have become production runs only because of Bonderite and Bonderlube.

These two remarkable aids in cold extrusion make metal flow like magic. More severe deformations are possible. Tool and die life are

multiplied. Rejected parts are few and far between. Production speeds are greatly increased. Smooth finishes are easily achieved and maintained.

The Parker cold forming staff can give you expert help in the technique of cold extrusion.



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BONDERITE
corrosion resistant
paint base

BONDERITE and BONDERLUBE
aids in cold forming
of metals

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surfaces

TROPICAL
heavy duty maintenance
paints since 1883

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SERVICE!

Lincoln is not content merely to produce molded thermoplastic parts to your specifications. Lincoln service extends from your engineering department to your production line . . . from helping you design the part that will do the job best for the least money to helping you install the best procedures for assembly of that part.

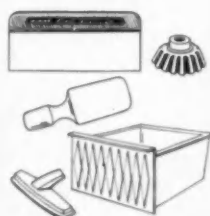
For details on Lincoln's "complete" plastic parts service, just drop us a line. Be sure to ask for your free copy of "Development and Progress," a 12-page bulletin describing Lincoln's complete, modern facilities for producing . . . on any reasonable delivery schedule . . . anything you need in injection molded plastics.



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MOLDED PLASTICS, INC., Dept. A, Circleville, Ohio

SUBSIDIARY OF GENERAL AMERICAN TRANSPORTATION CORPORATION



Coming—September 1st, the

AUTOMOTIVE INDUSTRIES Machine Tool and Production Equipment Issue

. . . edited exclusively for the production managers, new equipment engineers and the management decision makers in the automotive and aviation manufacturing industries.

UP TO THE MINUTE MACHINE TOOL AND PRODUCTION EQUIPMENT DATA . . .

Each September 1st, AI produces a seven section reference issue featuring new machine tools and new production equipment. This Machine Tool and Production Equipment issue is a complete, comprehensive coverage of new developments. It is a vital, authoritative reference source . . . a complete engineers' working manual. Seven fact-packed sections cover:

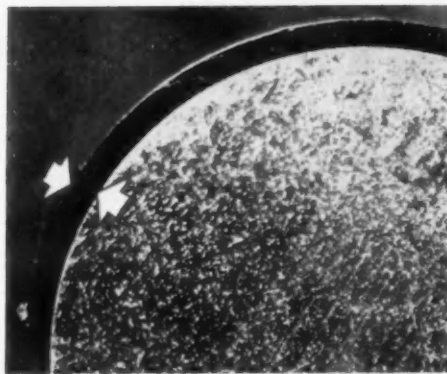
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- Welding Equipment
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All the special section editorial has been carefully screened and organized for sharpest focus of reader interest and for the greatest practical reference value. And—this issue will contain all the regular AI editorial departments.

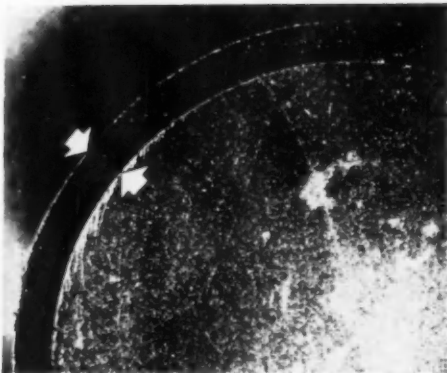
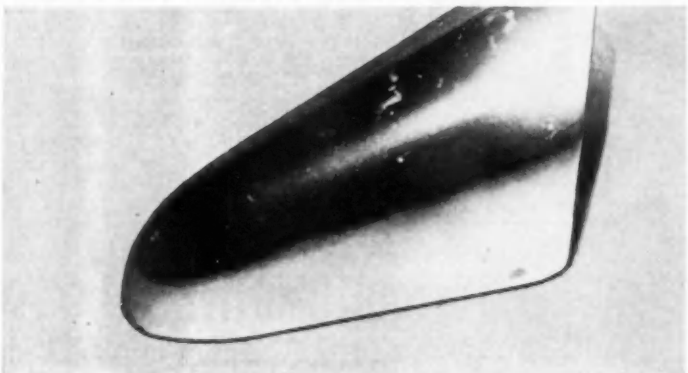
AUTOMOTIVE INDUSTRIES Chestnut & 56th Sts., Phila. 39, Pa.



UNICHROME BRIGHT CRACK-FREE CHROMIUM MADE THIS DIFFERENCE IN PROTECTION. Photographs show results of 72 hour acetic acid salt spray test. Part at top was plated with ordinary chromium according to automotive manufacturer's specifications for copper, nickel, chromium finishing. Part at bottom had same copper and nickel deposits but Unichrome Crack-Free Chromium replaced the ordinary chromium, thus greatly increasing corrosion resistance.



UNICHROME SRHS® CHROMIUM MADE THIS DIFFERENCE IN THICKNESS. Enlarged cross sections of identical steel rods show ratio of thickness of plate from ordinary chromium solution (top) to thickness from SRHS Chromium Solution (bottom) . . . a much thicker deposit in the same plating time!



How to get more corrosion resistance from chromium plate

When consumers find fault with decorative chromium plate, it's generally due to early corrosion.

This trouble starts with pores and cracks that occur in all ordinary chromium in the range of thicknesses generally used for decorative plating. Road chemicals, salt atmosphere and fumes find a path right down to base metal. Corrosion starts. As corrosion increases, finish failure progresses, allowing still more corrosion.

But you can stop this at the source.

THICKER, CRACK-FREE CHROMIUM

Chromium itself is passive. It doesn't corrode. Eliminate pores and overcome its cracking and you greatly improve its corrosion protection. Pores are eliminated by thicker plating. To overcome cracking, use the Unichrome Bright Crack-Free Chromium Process. This deposit is free from corrosion-admitting cracks. It has already been used in automotive production for a year.

MINIMIZE YOUR PRODUCTION PROBLEMS

Unichrome Crack-Free Chromium is far superior to ordinary chromium not only in protection, but also in operating advantages. The solution is self-regulating. It offers improved throwing power, also better coverage — even over passive nickel.

TO PLATE THICKER CHROMIUM

For those who desire thicker deposits but do not require freedom from cracking, other Unichrome self-regulating processes offer distinct advantages. They plate up to 80% faster than ordinary chromium plating processes. They cover parts with less dulling or burning, are less susceptible to clouding due to current interruption. Control is simplified by their self-regulating features.

Whichever process is best for your operations, Metal & Thermit has over 30 years of service experience to help you make it work. Call in an M&T plating engineer to survey your requirements, tell you what's needed for the results you want. Or, send for Bulletins.



METAL & THERMIT CORPORATION

GENERAL OFFICES: RAHWAY, NEW JERSEY
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LOW COST
"Utility"
HUCKBOLT FASTENER

(AVAILABLE IN STEEL OR ALUMINUM)

OFFERS:

- LOW COST**—An economy model of the well known Huckbolt Fastener offering the desirable features of that fastener plus some special features of its own.
- BROAD GRIP ADAPTABILITY**—Six sturdy locking grooves on the fastener pin allow an unusual grip extension for each grip-size of pin.
- THREE HEAD STYLES**—The "Utility" fastener is offered in standard brazier, round and 90° countersunk heads to meet your requirements.
- TWO COLLAR TYPES**—The "Utility" fastener may be used with standard 2LC collar or with the 3LC which has a broad, sturdy, pre-engineered washer as an integral part.
- FULL STRENGTH**—The "Utility" fastener offers full rated tensile strength of the standard CL fastener, diameter for diameter.
- CUTS STOCK REQUIREMENTS.** Six annular locking grooves provide greater grip flexibility thus affording full coverage of your requirements with fewer grip sizes.

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END NIGHT CLEANUP & MORNING REBLUING



DYKEM HI-SPOT BLUE No. 107 is used to locate high spots when scraping bearing surfaces. As it does not dry, it remains in condition on work indefinitely, saving scraper's time. Intensely blue, smooth paste spreads thin, transfers clearly. No grit; noninjurious to metal. Uniform. Available in collapsible tubes of three sizes. Order from your supplier. Write for free sample tube on company letterhead.

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INDUSTRIES
Goes into
Leading
Plants in the
Automotive
and Aircraft
Industries**



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BEAT the HEAT with

NEW 4-page booklet gives full information on how to use Dow Corning 44 Grease for long-term lubrication at temperatures ranging from -40. to 400 F. Tells where this high temperature silicone grease can help cut maintenance on ball bearings and plastic bearing surfaces. Provides detailed information on properties and gives case histories which prove 44 Grease won't oxidize, thin out or gum up.



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Up To 10,000 psi Oil from Shop Air!

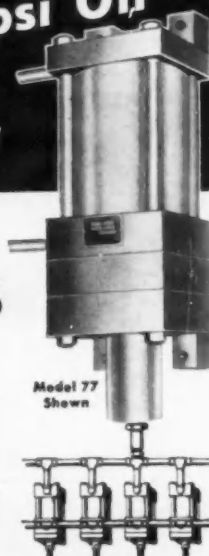


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BOOSTERS

No Pumps or High Pressure
Valving Needed

Hook a Miller Air-Hydraulic Booster to your air line and get INTENSIFIED (ratios up to 100 to 1) Hydraulic Power that you can vary and control at will and use for such common shop operations as punching, clamping, pressing, riveting, shearing, welding, crimping, testing, etc. High pressure booster output drives the hydraulic work cylinders and can be directly applied (without cylinders) in testing, measuring, other applications. Boosters save air, space, weight, require little or no maintenance, and hold pressure as long as desired without additional power consumption. Models for immediate delivery.



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Full Details



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Flick Reedy Corp.

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Lowers original equipment costs!

Lowers selling price of truck!

Lowers fuel, maintenance and replacement costs per truck mile!

Lipe

DIRECT PRESSURE CLUTCH

Vital component in today's most economical system of power transmission, the Lipe DPB Heavy-Duty Clutch costs less at the start... materially reduces the competitive selling price of the vehicle... and affords substantial savings in over-all truck-operating costs per mile.

Other elements of the power-train contribute to these savings, but the Lipe DPB Heavy-Duty Clutch absorbs the greatest shocks and fiercest friction, dissipates the most heat, and by its simplicity, direct drive, easy adjustment and replacement-exchange, keeps the vehicle rolling with less cost for fuel, brake relining, oil replenishment and repair. Its worth in highway safety and preventative brake maintenance alone places it far in advance of costlier and more complicated drive components.

Advanced thermodynamic design and positive air circulation add up to a heavy-duty clutch of uncomplicated design with few moving parts. In short, it's a clutch with a low maintenance cost that matches both its low first cost and greatly lower truck-mile costs of operation.

● Lipe DPB clutches now available in 12", 13", 14", 15" single and two plate models. Write for engineering data sheets on the sizes which interest you.

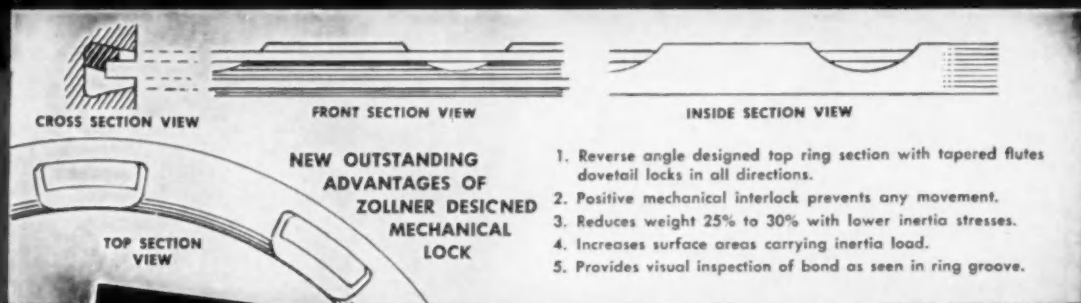


Lipe-ROLLWAY
CORPORATION
SYRACUSE 1, N. Y.

MANUFACTURERS OF AUTOMATIC CLUTCHES AND MACHINE TOOLS

BOND E LOC* PISTONS

WITH "NI-RESIST" IRON TOP RING SECTION



Double Bonded
METALLURGICALLY
Al-Fin Bond

MECHANICALLY
Zollner Lock

STOPS!

RING GROOVE WEAR IN HEAVY DUTY SERVICE

"Sensational mileage" is the unanimous report of heavy duty engine builders and transport operators using Zollner "Bond-O-Loc" Pistons. Another great development by Zollner engineers, this super-mileage piston has a "Ni-resist" top ring groove section *permanently* incorporated with the *double bond* of both Al-Fin metallurgic and the exclusive Zollner mechanical lock. Separation failure is impossible. Ring groove wear problems are eliminated, blow-by prevented, oil consumption minimized, mileage to overhauls greatly increased. We suggest an immediate test of these sensational advantages for your engine.



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ENGINEERING
PRECISION
PRODUCTION
COOPERATION
with Engine
Builders

ZOLLNER

THE ORIGINAL EQUIPMENT PISTONS

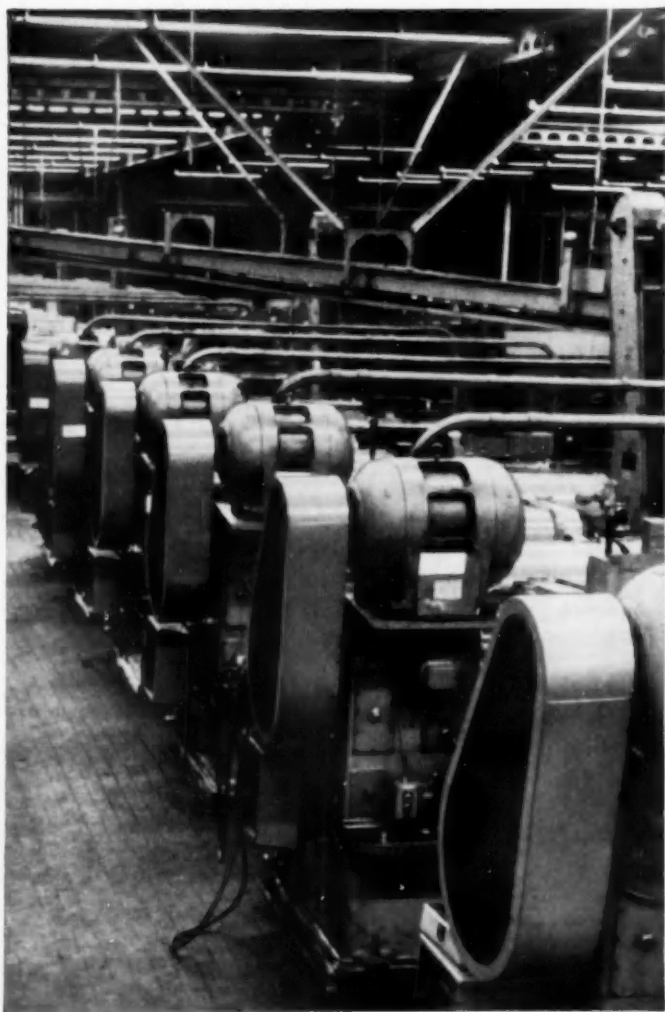
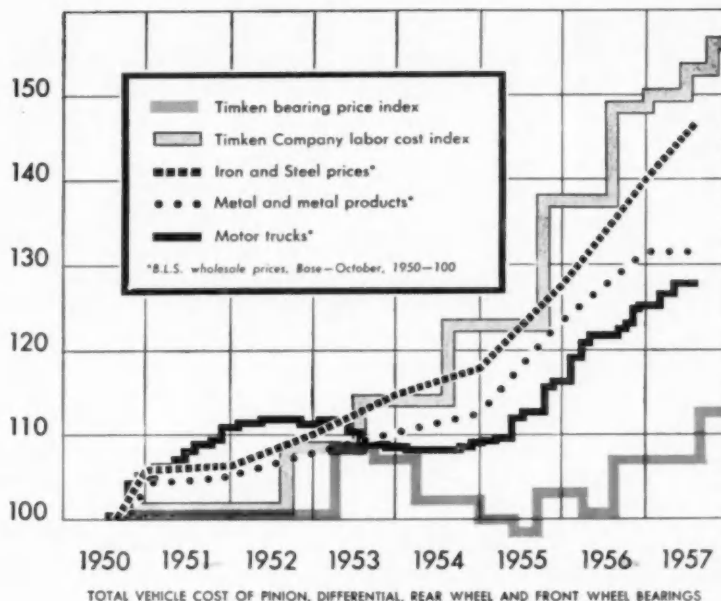
PISTONS

ZOLLNER

ZOLLNER • Fort Wayne, Indiana

Here's how truck-makers have helped hold the line on bearing costs

Almost everything a truck-maker buys has shot up in the last few years (see right). But the cost of Timken® tapered roller bearings for trucks has stayed down. Truck-makers themselves helped do it by 1) standardizing on fewer bearing sizes so we could produce them more efficiently and 2) using the new-design Timken bearings wherever they could. These are low-cost, capacity-packed bearings made in standardized sizes by the most modern machinery and methods in the bearing industry.



And here's how they can help keep them at rock-bottom

Here's a section of our Bucyrus, Ohio plant that uses revolutionary machines and techniques to produce over 30 million Timken bearings a year. From raw steel to finished bearings without a hand touching them. And we pass the manufacturing savings on to you. These missile age methods can keep your bearing costs down if you do two things. 1) Standardize on still fewer Timken bearing sizes for trucks making our production even more efficient. 2) Use more Timken bearings and increase the manufacturing savings by keeping these machines going full-tilt. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

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STANDARDIZATION



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TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS